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*Report on the Kooloo Iron Mines and on a portion of the Mannikurn valley.—By M. MARCADIEU. (Communicated by the Government of India.\*)*

Before my arrival in Kooloo, the information I had received of the mineral resources that this country appeared to offer, embraced nothing of its iron mines; their existence was completely unknown. The information was confined to the fabulous recitals of the Mannikurn thermal waters, and to the existence of sulphurets of iron and lead within this same valley. Arrived on the spot, at the first sight of a rock from Futteepore, I saw directly, and ascertained by experiments, that it contained magnetic oxide of iron. This fact acquired, led me to the examination of the soil, which entirely confirmed it.

A second mine of oligist iron, was discovered thus; while conversing with Captain Hay on the probability of meeting with oligist iron in the quartz mountains in the vicinity of the thermal springs of Mannikurn, it occurred to him, to make use of his just authority to question the natives. The influence that he exercises over them, led to the best results, for one of them soon brought us a block of badly smelted iron and some specimens of the mineral metal, extracted clandestinely from a neighbouring mountain.

The first of these mines, the magnetic iron ore, is situated near

\* Some pains have been taken to improve the composition of this report, which should rather have been drawn up in French and then translated. Occasionally passages have been omitted where there were doubts of the writer's meaning.—ED.

Futteeppore, South west of Sultanpore, facing the village of Quageah, and the road from Kooloo to Simla. The mountain containing this mine, is called by the natives, Jilly Pronally. It belongs to the chain extending from East to West, and is bounded at its summit, by a table-land adjoining the mines and the possessions of Mundee. It is a large ravine serving as a pass, leading to the villages of the table-land, and owing most likely, its enlargement to the erosion of pluvial waters. The rock in which the grains of magnetic oxide of iron are embedded is a mica schist of the same nature as the mines already described in my first reports.

It is to be remarked that the blackest lines of stratification, that is to say, those containing the grains of oxide of iron, generally contain less mica, than those of a lighter colour, and that the rock passes as it were to the grey wacke. To the left, on ascending this ferruginous ravine, the mica schist which borders it, contains no iron.

It would appear that the mineral extends under the table-land, in a line perpendicular to the mountain, inclining however to the right, the only part exposed at about thirty feet from the summit, seems to run in that direction. The existence of this mine was completely unknown to Europeans, though worked by the Natives of the neighbouring villages for a length of time. Though the country is well wooded, this work is limited to four small furnaces, similar to those of Mundee and elsewhere. This mine, in its physical character, as well as in its composition, exactly resembles all the magnetic iron mines described in my former reports; it contains from 10 to 15 per cent. of magnetic oxide of iron. In its natural state this mine is poor, but the ease with which the oxide of iron can be separated from the rock, places it in the same category as the mine I have already described.

The oligist iron mine is situated in a mountain of quartz bordering the left side of the torrent Parbutty, facing the thermal springs, but on the Southern slope opposite the Mannikurn valley. Owing to the impossibility of reaching the mine from this side, on account of the steepness of the mountain, Captain Hay, myself and the guide, retraced our steps to the village of Deah, picturesquely situated on the summit of a mountain facing Bijowrah. We started thence to make a fresh excursion, but on arriving at a certain



distance from the mine, insurmountable difficulties presented themselves, the rapid declivities which we had to ascend and descend rendering it impossible for us to reach the bed of this ferruginous deposit, to study its extent. Natives on the contrary, circulate in these dangerous places with surprising facility; the most intelligent of my servants after having received my orders repaired to the spot, in company with guides, who work a little of this iron. They brought me back specimens of the mineral, part of which has been sent to the Chief Commissioner, and they repeated to me that which I had already learnt from a Native, that the iron was extracted from a vast cavern, and that it existed in streaks of great thickness, alternant with quartz. It must not be thought, that the obstacles which prevented us from reaching this mine are difficult to overcome, for a road could easily be made which would render access to it easy, and I am convinced, that orders to that effect will soon be given by the Commissioner of the Kangra District, it being important that the question connected with the development of ferruginous resources should be seriously taken up. This oligist iron mine promises by its position in a well wooded country, to furnish largely to those resources. Let the distance of about 200 miles, from Kangra to Kote Kaei be surveyed, that is to say, the range of mountains in which is found the mineral of magnetic iron, what fuel is there to be met with? A few trees scattered here and there, scarcely sufficient for the manufacture of a few pounds of iron daily; it is a fact, nothing or nearly nothing is to be met with; whilst in the greater portion of the Kooloo district, a rich vegetation exhibits itself. It is then in Kooloo, that I propose establishing iron works, on a large scale, and I would there collect the produce of the neighbouring mines of Nolata, Core, Durmany, Surmany, and Currany, they are all in the Kangra district, and in the vicinity of Kooloo, and if necessary, a call could be made on the Mundee mines. One question only remains to be solved; that is, to ascertain if the Natives of the five villages just mentioned can communicate with Kooloo, without passing over the old road of Harabagh, &c. and to find out if the mountains to the East, which separate these two localities would permit of a road being made. This enquiry belongs to the Engineer's

department and could be made in a very short time. If, as I believe, this opening is practicable, the transport of the magnetic oxide of iron from the five villages could be speedily performed on beasts of burden, and we should then have obtained all the conditions necessary for the success of this project.

Bijowrah struck me as being the most suitable spot to establish the building for the reduction of the iron ores. Its position is not only central to the mines and the fuel supplies, but presents the double advantage of being on the direct road to the plains *viâ* Kangra and Noorpoor: having close at hand a watercourse, with proximity to the Bias to increase the motive power if required.

The forest to the East, and the magnetic iron mine situated in the same direction are at about twenty miles from Bijowrah; the oligist iron mine as well as its neighbouring forests, at about the same distance; and the Northern forest from twenty to twenty-five miles.

Such being their situations Bijowrah offers the nearest central spot, both to the mines, and to the fuel, and is the most convenient for the transport of the manufactured iron. The pine preponderates generally in these forests, but in the hills to the East, the oak is found in rather large abundance. Far be from me the idea of exaggerating the resources of the Kooloo forests. I have on the contrary been very moderate in my expressions, because I am anxious that Captain Hay, who is in charge of the district, as well as the topographic work compiled by Major Longden, of Kooloo, should be consulted on the subject. I repeat it, in the part of the Himalayás that I am acquainted with, Kooloo is the only spot capable of supplying fuel to works of any importance, but we must not conceal the fact, that mountainous countries are far from presenting on this subject the same facility as the plains; the construction of roads is more difficult, the distances to go over more laborious, and often longer, and consequently the transport of materials, more expensive.

But where in the actual state of things, can we find any thing better for present wants? We must then submit to the necessity of position, and consider it very fortunate to foresee the possibility of erecting a useful establishment, in a country situated in the

vicinity of other districts unprovided with fuel. In one word, it is already something to be able to enter into the limits of the possible in this part of India, it is even a great deal; but to be successful, there are conditions to fulfil, which must not be lost sight of. These conditions consist in the art of making charcoal.

At first sight the carbonization of wood seems so easy an operation, that the most limited intellects can direct it, following the old system of routine, established by the vulgar. These ideas have been the cause of many errors, and of failure in many industrial enterprises. It is indispensable that, in this country especially, where the scarcity of wood, fit for the manufacture of charcoal, is sensibly felt, we should endeavour with care, to bring into use the perfected operations that science can furnish to increase a production, so necessary to industry; but to succeed in this manufacture, it would be necessary that the direction be entrusted to a European, who should have acquired by experience the knowledge, theoretic and practical, of the art; the advantages resulting from such a rational direction would be, as I will prove, of the greatest importance.

The wood for carbonization, the most generally distributed over this country, is the pine. It is then on this wood that I am going to establish the comparative results furnished by experiments, which are equally applicable to the oak. The experiment which has been taken as a starting point for the improvement of the manufacture of charcoal, consists in the determination of the quantity of carbon which 100 parts of wood simply dried in the air contain.

It resulted from this experiment that the mean of this quantity was 28 parts: this datum compared with the results obtained by the ordinary defective means, of which the average quantity was only 15 to 16 per cent., impressed on the mind the importance of finding means for improving the process, and enlightened by previous experiments, performed on small proportions, we arrived by the help of simple modifications, founded principally on the manner of conducting the combustion, to obtain from 25 to 31 of charcoal. In practice that is the highest number attainable, and the number 31 can only be obtained by an intelligent superintendence, during the whole time of the operation. These are the

results of the produce of three qualities of pine growing in the different parts of Europe.

Pinus picca.	} Dried in the air, consequently having lost
Pinus abies.	
Pinus silvestris.	
	5 to 6 per cent. of water.

The mean by the defective process, is 13 to 14 per cent. By the improved process 26 to 28; I hold it essential to set forth this enormous difference to prove the importance of endeavouring to obtain the maximum in this country, for the difference is nearly double, and consequently from the same quantity of wood, a double quantity of iron could be obtained. These advantages would be of the greatest importance, in an economical point of view, and consequently require the strictest attention on the part of Government. It is the more necessary to try and attain them, with this firm conviction that success is assured by complying with the rules prescribed by experience and observation.

If by chance the person charged with the direction of these practical works had not a knowledge of some of these improvements, I would with pleasure furnish all the information he might wish for, on the subject, as well as the plans, connected with the work.

Kooloo is an interesting country, worthy of a serious study for many other things, throughout the whole of its extent. The existence of sulphurets of copper, lead and iron, in different places of a district, is often the foreteller of interior metallic deposits, sometimes rich, and sometimes poor. These characteristic signs never escape the European mountaineers who make a profession of mine-seeking; they call these sulphurets, *flowers*. When they fall in with any during their laborious excursions, they attack the soil with that ardour, that is inspired by the hopes of success, and it must be granted that if the works of these intrepid men are often unsuccessful, it is just also to say that sometimes they derive from them the finest results. Certain parts of Kooloo are precisely in the position to excite the courage of the mine-seekers of Europe, the *flowers* appearing as a certain pledge of success, but we should never in these investigations go beyond the limits of prudence. The valley of Munnikurn offers examples of these indications, which



have at different times roused the cupidity of the natives of this country, but the superficial excavations made without intelligence, have always been unfruitful. In the ravine of Jury near Roupie on the left bank of the Parbutty, the sulphuret of lead forming nests in a compact quartz more or less translucent, resting on the mica schist, is found nearly on the surface of the left slope of the ravine, on a limited extent of about 15 feet, and at some distance thence a few blocks of quartz are occasionally met with, containing sulphuret of iron. As it appears exposed on the soil, this sulphuret of lead presents no real material interest, but they are *flowers* placed in evidence as a characteristic sign, often deceitful, of mineral wealth buried at a certain depth. This quartzose is met with in large quantities, in the extremity of the same valley near the village of Honchide, on the right bank of the Parbutty. A gallery made some time ago by the natives, allows you to penetrate to about 25 feet into the interior of the mountain.

It is said that during the reign of the Seikhs, they worked this mine as argentiferous, but in this, there can be no truth, for the specimens I examined and analysed did not furnish the slightest trace of this metal and, besides, the natives would never have forsaken it, had they been sure of finding silver. It is more probable that these defective works have been undertaken in the hopes that the sulphuret of iron, of a seducing appearance, would lead to the discovery of a precious metal, and that they have been forsaken, because the natives were ignorant of the means of following up these rescarches without danger. There exist in other parts of Kooloo sulphurets of copper, that it would be important to examine; I had not time to visit these localities, because the orders to start for Pongah only left me a short time to examine rapidly the most interesting parts of the Munnikurn valley. It is essential to examine and ascertain the industrial value of these copper mines, for if rich, they might be joined to the iron works of Kooloo.

There remains now to speak of the Thermal springs of Munnikurn, that have been so falsely praised for their medical virtues. This spring is in the transversal valley of Munnikurn, situated in a direction East to West at about 20 miles from the lateral valley through which flows the Bias. It issues in an enormous volume

through the fissures of the mica schist, upon which repose a few quartz rocks. The hottest of the springs are the nearest to the right bank of the Parbutty in the village of Munnikurn.

There are several springs close to one another, occupying a space of about 30 feet, the principal basin, the one furnishing the greatest abundance of water, forming nearly a circle of about three to four feet in diameter, the sides of which are covered with a deposit of ferruginous travertine, in appearance, something like a cauliflower.

The water from this basin issues through the fissures of the rocks with a violent bubbling, accompanied with a deafening noise produced by the escape of a considerable quantity of aqueous vapour, depositing at the same time on the surface the calcareous concretions just mentioned, which it brings from the bowels of the earth. There are also disengagements of gas, of which I could not determine the nature, not having the graduated instruments necessary to collect it, nor the reagents indispensable for these sorts of pneumatic operations, but I will fill this gap as soon as I possibly can, not only on this water, but on all those which I have examined or may analyse hereafter, being well aware, that the determining gas contained in mineral waters in general, is the necessary complement to the work.

The temperature of the principal basin, taken several times was 202° Faht. that of the air being 63° Faht. The coincidence existing between this temperature and the point of ebullition which is also 202°, is very remarkable. There results then from this similarity, that with the temperature of the water from the basin, in case of need, the elevation of the spot from which the water issues can be taken; for the water of the source is really in a state of ebullition. The elevation taken on the 1st of May, 1854, at  $\frac{1}{2}$  past 9 A. M. was 5,705 feet above sea level. When this elevation is compared with the ascensional distance that the thermal waters are obliged to flow over to arrive from the depth of the earth where it is heated, to the surface of the soil, (a distance taken from the law of increasing temperature in proportion as we penetrate into the interior of the earth in a vertical direction,) we come to the consequence, that the distance gone over by the liquid is at least 7,911 feet, that is 2,206

feet beneath the level of the sea. This depth must be still greater, but the mean temperature of the village of Munnikurn not being known, I was obliged to take for a starting point  $63^{\circ}$  Faht. which is certainly too high. This reminds me how important it would be, to determine, in the different parts of India, the line of invariable temperature of the earth; we should then have the mean temperature of places without being obliged to perform long and tedious thermometric experiments, which cannot always be performed with exactitude every where, and we should equally be able to obtain more accurate notions of the nature of the climate and vegetation. I am well aware that the mean temperature of such localities as have been inhabited for a length of time by Europeans is well known, but it is seldom that those localities offer the scientific interest met with in isolated places, in mountainous countries for example, which are only occasionally visited, and in which, for that reason, a long series of thermometrical observations can rarely be taken.

It results from observations made in Europe and America, that the invariable line of temperature increases in depth, as we approach the poles, and that it diminishes as we increase the distance from them. In the temperate climate of Europe, it varies between 79 and 89 feet beneath the surface of the earth, whilst under the tropics the larger invariable is found at 13 inches. These data lead us to conclude, that in India we should not have to excavate to any great depth to find the larger invariable, showing the mean temperature.

The thermal springs of Munnikurn, though they belong to the class of the warmest met with in nature, do not however reach the highest degree of temperature known. In fact, the heat of  $202^{\circ}$  is exceeded by many other springs, and to give two examples, I will name those of Camarguillas in Mexico indicating 205.5, and those of Las Teruncheras, the temperature of which has increased within the last 24 to 25 years from 194.5 to 206.6, Faht. Two facts characterise the thermal springs of high temperature; 1st, their purity, that is to say, the minimum portions of mineral substances which they contain; 2nd, the variability of their temperature. I am not aware, if the waters of Munnikurn have or have not under-

gone any change in their temperature, observations being deficient on the subject, but it is positive that, in their actual state, they are in a medical point of view unimportant. 10,000 parts of this water contain only 3.2 of saline substance composed of chloride of sodium, sulphate of soda, chloride of calcium and carbonate of lime. A simple evaporation followed by calcination, with the weight of the produce, is sufficient to show, that with the exception of their temperature, these waters differ little from ordinary drinking water. It is nearly the same with the springs of Beshist and Ketat, of which I analysed the waters. These two springs are in the large lateral valley of Kooloo, the first on the left bank of the Bias, temperature  $117^{\circ}$ , the second on the right bank, at about 10 miles from the first, temperature  $102^{\circ}$ . Both issue from the mica schist. These springs contain the same salts, as that of Munnikurn, but in different proportions. That of Beshist furnished in 10,000 parts, 7 of saline matter, that of Ketat, also in 10,000 parts, furnished 8.

Though these proportions are larger than in the Munnikurn waters, they are not sufficiently large to entitle the springs to the denomination of medical mineral waters; it is to be remarked that they only belong to the class of saline springs, no gas communicating to them any striking properties. The Ketat spring contains a substance of an animalized odour, which gives to the residue from evaporation a very characteristic shiny appearance. We thus see that the properties of the thermal sources of Kooloo are reduced to the salutary effects of hot baths.

This reality is however not appreciated by the natives of Kooloo, especially as regards those of Munnikurn, which they consider to possess supernatural virtues. It is true that the abundance and high temperature of this source as well as the considerable quantity of vapour discharged with noise from this burning furnace, is calculated to impress deeply the mind of these people naturally disposed to superstition. The Kooloo population is gifted by nature with intellectual advantages which are not so conspicuous elsewhere in this neighbourhood—regularity of features, a projecting forehead, and an open facial angle characterise the natives of this privileged country. The decided taste they have for flowers, with



which they ornament their heads, with an elegance truly remarkable, give to the frequent assemblies of their rural merry-makings, that character of simplicity and artless coquetry, which brings to the mind the language of the heart of the bucolics of Virgil and of the Idylles of Theocritus.

Independently of the principal spring of Munnikurn, there exist many others over an area of about  $\frac{1}{4}$  of a mile, the whole length of the village. Their temperature is not so high, because they mix with neighbouring cold streams. The natives have taken advantage of this circumstance to construct baths, the keeping of which is entrusted to people who praise the curative virtues of the water with the prophetic language of true believers; this preamble of praises is addressed with still more fervour to European travellers to invite them to bathe first, and then to obtain a gratification, the largest possible, but there, as elsewhere, we may write in large letters this philosophical maxim, “*Jamais la renommée ne se réduit à la vérité.*”

When we fix our attention on the creation of this vast silicious deposit, bordering the two sides of the Parbutty, in the Munnikurn valley, and especially its right side, where the hot springs are, we must admit that a powerful chemical action has been in force during this deposit, and that action can only be attributed to the mineral waters, which appear to have played an important part at a time when their temperature was much higher than it is at present, and their volume much more considerable. At present it is no longer the same; we have but a weak manifestation of an action, which has been at some distant period of great power: the waters in a length of time leave but a thin and limited bed of carbonate of lime. However the brilliant researches made in Europe in the case of deposits of different ages made by the same spring, have proved in the most evident manner, that the mineral waters had changed their nature several times, and that they had at one time abundantly deposited substances, which at present they no longer contain. The theory of these researches founded on facts, is in all probability, applicable to the Munnikurn thermal springs: the silicious deposit would have been its first work, which has been succeeded by the limited deposit of ferruginous travertine of the present

epoch. But between these deposits, there exist perhaps intermediate ones, and on this subject I proposed making researches as well as into the dip and direction of the quartz, when the order to start for Thibet prevented me.

In the valley of Munnikurn there are three qualities of quartz—1st, quartz compact with a fissure slightly scaly and translucent, in layers subordinate to the mica schist. 2ndly, the compact granular quartz more or less opaque, with a schistoid texture, containing globules of mica disseminated and mingled, as it were, with the mass. 3rdly, the mica granular quartz, which extends in a more constant manner on the right banks of the torrent, in a north-westerly direction for a distance of more than 10 miles, from the thermal springs, showing at rare intervals a few layers of mica schist. This rock prevails over all others of the same nature, and is so friable, that the frequent landslips give to this part of the valley, an appearance of disorder and sterility that saddens the observer. All leads to believe that this deposit of quartz reposes on the mica schist. Erosions caused by the waters have uncovered, in the lower part of the valley, layers of mica schist in a perfectly horizontal position. The mica is not seen in an uniform manner throughout this vast deposit of quartz; we fell in with series of rocks, that contained only small portions scarcely visible with the magnifying glass, and had the aspect of quartzite or quartzfels. If the Kooloo district is interesting, in a Geological point of view, we have seen that it is not so in a medical sense, as far as the mineral waters are concerned.

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*Note on the Limboo Alphabet of the Sikkim Himalaya.—By DR. A. CAMPBELL, Darjiling.*

Lieut. George Mainwaring, of the 16th Regt. N. I., (Grenadiers) who has applied himself very sedulously to the acquirement of the Lepcha language, as well as the Thibetan, favoured me, a short time ago, with the annexed copy of the Alphabet of the language of the Limboos, a numerous tribe, inhabiting the eastern

ॐ Kim ॐ Kum ॐ Kōm

ॐ Kōm ॐ Kaim

ॐ Kōng ॐ Kēng ॐ Kēng

ॐ Kūng ॐ Kūng ॐ Kōng

ॐ Kōng ॐ Kaing

ॐ Kaing ॐ Kēng ॐ Kēng

ॐ Kūng ॐ Kūng ॐ Kōng

ॐ Kōng ॐ Kaing

ॐ Kal ॐ Kēl ॐ Kēl

ॐ Kul ॐ Kul ॐ Kōl

ॐ Kōl ॐ Kail

ॐ Kap ॐ Kēp ॐ Kēp

ॐ Kip ॐ Kup ॐ Kōp

ॐ Kōp ॐ Kaip

In like manner with ॐ a.  
and the rest of the Conso-  
nants.

ॐ Kya ॐ Kyē ॐ Kyē

ॐ Kyi ॐ Kyu ॐ Kyō

ॐ Kyō ॐ Kyai

ॐ Kyāk ॐ Kyēk ॐ Kyēk

ॐ Kyēk ॐ Kyūk ॐ Kyōk

ॐ Kyōk ॐ Kyaik.

ॐ Kyāk &c. and so on with

the remaining finals.

ॐ Kara ॐ Kēre ॐ Kēre

ॐ Kiri ॐ Kuru ॐ Kōro

ॐ Kōro ॐ Kairai

ॐ Karāk ॐ Kērek ॐ Kērak

ॐ Kirik ॐ Kuruk ॐ Kōrōk

ॐ Kōrōk ॐ Kairaik

ॐ Karāk ॐ Kērek. &c.

&c.

ॐ Can take no final after et

○ Placed over a letter gives et  
an acute accent, as ॐ ki

ॐ Is sounded long it is me-  
rely a prolonged final note  
to the reading chaunt.

// Is the colon stop.

The Lumboc or Yakthung ba Language consists of Twenty Eight Letters viz. nineteen Consonants and nine vowels, which are as follow.

### Consonants

Ka Ba Ma Ta Ya

𑖅 𑖆 𑖇 𑖈 𑖉

Tha Ra Sha Nga Sa

𑖊 𑖋 𑖌 𑖍 𑖎

Wa Ha La Ja Bha

𑖏 𑖐 𑖑 𑖒 𑖓

Kha Ra Chal Hya

𑖔 𑖕 𑖖 𑖗

### Vowels

a ē ē ī ī u ō ō ai

𑖘 𑖙 𑖚 𑖛 𑖜 𑖝 𑖞 𑖟 𑖠

There are also Seven

### Finals

- 𑖡 ak - 𑖢 āk - 𑖣 am

- 𑖤 āng - 𑖥 āng - 𑖦 ah  
- 𑖧 ap.

Similar with the Tibetan and Lepcha this language has also a "ya x Ba" affixed thus

𑖨 ya - 𑖩 Ba

The vowels, Finals and ya & Ba are thus affixed to the Letters.

𑖊 Ka 𑖋 Kē 𑖌 Kē 𑖍 Kē

𑖎 Kī 𑖏 Ku 𑖐 Kō 𑖑 Kō

𑖒 Kai

𑖓 Kāk 𑖔 Kēk 𑖕 Kēk

𑖖 Kēk 𑖗 Kūk 𑖘 Kēk

𑖙 Kēk 𑖚 Kāik

𑖛 Kāk 𑖜 Kēk 𑖝 Kēk

𑖞 Kīk 𑖟 Kūk 𑖠 Kōk

𑖡 Kēk 𑖢 Kāik

𑖣 Nam 𑖤 Kēm 𑖥 Kēm



portion of the Nipal Himalaya. Many of them have in late years migrated into the Darjiling territory; and there are a few of them settled in Sikkim.

It was from one of the tribe in the neighbourhood of Darjiling that Lieut. M. procured, or rather compiled, the Alphabet. I had mentioned to him, that it was very desirable to procure some written specimens of this language; and fortunately, I think, he has succeeded in doing so. Mr. M. possesses a small book in the Limboo character.\*

The Limboo language is now practically extinct as a written one. The character is not used now—or very rarely indeed—and the small book procured by Lieut. Mainwaring is the first example I have seen, after many years endeavouring to procure one for the Society. Many years ago, I brought the existence of this language to the notice of the Society: (see Journal for 1843) and I was at that time promised an extended detail of its gradual disappearance; but Ilam Singh, the late Dewan of the Sikkim Raja, who made me the promise and who was himself a Limboo, and well qualified to do so, died soon after.

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*Observations on the Graphite or Plumbago of Kumaon and of Travancore.—By Dr. ROYLE, F. R. S. Communicated by the Government of India.*

Specimens of Graphite and Plumbago have, on various occasions, been sent from different parts of India and a desire expressed to have their value ascertained in this country.

Thus at the exhibition of 1851, there were specimens from Almorah, Vizagapatam, and Travancore.

The specimens from Travancore are in nodules, extremely soft but brilliant, very like the Ceylon Graphite, of which some quantity has, for some time, been imported and sold for about £8 to £10 a ton. Some of the purer specimens of Travancore would rank

\* See Proceedings for May when this book was exhibited at a meeting.

with them, but all impurity greatly deteriorates its value: the Vizagapatam in its present state, seems to be worthless.

Graphite has on several occasions been sent from Almorah as in 1849 and 1850; again in 1851, and lastly on the present occasion. It was first discovered by Captain Herbert near Almorah, who describes cutting it into slices, of which he made pencils, shewing that it had some of the qualities required in that substance. The specimens sent in 1849 and 1850 were examined and reported on by the late Mr. Phillips and also by the late Mr. Brockenden, the latter of whom was well acquainted with the practical uses and commercial value of Graphite, but he pronounced the specimens, for any purpose that he was acquainted with, as useless, and therefore worthless. The same opinion was again given to me by Mr. Brockenden before his death.

If the enormous value (from 30*s.* to 50*s.* a pound) of good Graphite, is considered, the declared worthlessness of these Indian specimens seems to be unaccountable. It is desirable to ascertain what constitutes the value of good Graphite, and what causes the deterioration of that from India. For this purpose, it is necessary to notice the different uses to which this substance is applied. These are 1st for making pencils, 2nd to diminish the friction of machinery, 3rd to make fire-proof crucibles, 4th to *black lead* grates as it is called. For all these purposes, except the last, it is evident that purity is essential.

1. The best pencils were formerly made of the Borrowdale Graphite, obtained from a mine which is now exhausted. This kind was pure and compact, and sold readily at about 40*s.* a pound. It was sawn into thin slices, these were inserted into the groove of one half of cedar pencils and the superfluous part filed off, then the other half was glued on to the filled up half of the pencil. It is evident that for such a purpose only the purest specimens were of any value, for the presence of a bit of quartz or of an ore of iron, or of any other metal, would injure the tools and fracture the thin slices or slender prisms of Graphite, and if they did not produce any of these effects, they would be very inconvenient at the point of a pencil for whatever purpose employed. Indeed if it had not been for the discovery that finely powdered Graphite can by an extreme

degree of pressure be rendered nearly as compact as the best natural Graphite, we should have been without any more good drawing pencils. But the Graphite for grinding, though in small pieces, must be pure, or otherwise the grinding mills become injured, besides pencils made with it, being unfit for use.

2 & 3. So also finely powdered Graphite is required for mixing with fatty substances in order to diminish the friction of machinery. It is equally evident, that this must be of the purest kind, or otherwise the machinery in which it was prepared, or that to which it was applied, would be equally injured. Thus also if Graphite, as an infusible substance, is required for mixing with the more infusible kinds of clay for making the best crucibles, the Graphite must be without impurities, as these would diminish the melting point and render the crucibles useless.

4. The Graphite or Plumbago black-lead as it is commonly called and used for polishing grates, is an impure substance, but if it has sufficient lustre it may be applied to such a purpose; it is however always a low-priced article.

Notwithstanding the unfavourable opinion entertained, by Mr. Brockenden, of the Graphite from Kumaou, I again submitted to him the specimens sent to the Exhibition of 1851 as well as those which had been forwarded from Travancore. He considered both as valueless, so Messrs. Reeves, whose opinion I likewise asked, accounted them "quite useless for the manufacture of black-lead pencils." Messrs. Wolff of Church Street, Spital Fields who also make pencils by first grinding and then condensing Graphite, took a more favourable view of the specimens, inasmuch as they could not conceive why pure specimens should not be found in the localities where both kinds had been collected. But they also observed, that they could not use the specimens in the state in which they had been sent, without damaging their machinery, and it would take time and labour, costing of course a good deal of money in this country, to separate the purer specimens from those which were intermixed with quartz or ores of iron.

Among the Travancore specimens, however, Messrs. Wolff observe, many are sufficiently pure for use, and if these were picked out in India and sent separated from the pieces covered and inter-

mixed with quartz or iron ore, there is no doubt, that it would sell in the markets for at least £8 or £10 a ton, according to its purity, and perhaps higher. As Trevandrum, near to which the Plumbago is found, is in the vicinity of the sea and near a port like Cochin, there would be very little expense in land-carriage, and therefore freight would be the chief charge, but this might not be high, as Plumbago is sometimes sent as ballast.

With regard to the Graphite from near Kumaon, Messrs. Wolff state, like Mr. Brockenden, that they cannot use it in the state in which it is sent, in consequence of the quartzzy sand and iron ore with which it seems to be intermixed. But from the internal purity of some of the Graphite in nodules, as well as from the appearance of the larger specimens, they conceive that pure specimens of compact Graphite should be found in the same locality. But of this, those examining the localities themselves must be better judges than those looking at hand specimens. It is certain that no specimens have yet been sent, sufficiently pure to be sawn in slices or for grinding in the mills. The specimens last sent are valued at not more than £5 a ton.

Mr. Ruel celebrated for making crucibles (v. Jury Report) considered that the specimens from Travancore were not worth more than 8s. a cwt. for his purpose, though the price is sometimes as high as 14s.

A good practical test, I am told, is that of chewing a small piece, when, if not gritty, it will probably be found to be sufficiently pure for grinding up.

It is possible, however, that the enquiries now being made by chemists may devise methods by which the impure specimens may be made available for purposes not yet generally known. I have been asked by one of our intelligent chemists to ascertain the quantity in which the Travancore Graphite can be obtained, and the cost per ton at which it can be delivered on board ship. It seems desirable therefore to forward a copy of this communication to Travancore as well as to Kumaon.

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*Memorandum on an unknown Forest Race (of Indian Veddas?) inhabiting the Jungles South of Palmow; and on the deserted city of Dhoolmee in Manbhoom.*—By HENRY PIDDINGTON.

About the year 1824 or 25, being then extensively engaged in Coffee-planting, I used to have large gangs of Dhangur and Cole coolies coming direct from their country to work on the plantations. The principal factory where I resided was, so to say, accessible by one road only, being situated in a deep nook formed by an extensive jheel.

Shortly after the arrival of a large gang of Dhangur coolies, I noticed on my rides and walks that great numbers of the village people were constantly coming and going to and from the factory. They used always to come and go freely on their little affairs with the coolies or servants of the establishment, but the concourse now was almost like that to a *hát* or *melá*. Remarking this, I at length enquired of my principal assistant, a very respectable Portuguese man, what the reason of it was. He told me in reply, that the people were flocking from all quarters to see what they called the "monkey people." Upon enquiring who these people were, he informed me that with the last gang of Dhangurs there had arrived two persons a man and a woman, "who are exactly like great monkeys, Sir, and the natives call them the monkey people (বাদর লোক). They cannot even talk the Dhangur language properly, Sir, but have a language of their own."

I desired these persons to be sent for, and certainly they in all respects, and especially the man, justified the epithet which the villagers had applied to them. He was short, flat-nosed, had ponch-like wrinkles in semicircles round the corners of the mouth and cheeks, his arms were disproportionately long, and there was a portion of reddish hair to be seen on the rusty black skin. Altogether if crouched in a dark corner, or on a tree, he might well have been mistaken for a large Orang-Utang. The woman was equally ugly: I shall state presently why I did not take down an exact

description of them at the time. I should remark here that I was not like a person newly arrived from England liable to be led away by an imagination excited by the previous account of these people, for I had seen many varieties of the human race from the Bosche-man and Hottentot of the Cape, eastward to the Papua and Harafora, the savage of New Holland and New Zealand, and the Kanakas of the Sandwich Islands, and I had looked at these too not incuriously, but these people were evidently so different from the Dhangurs (and so considered by them too) that it was impossible not to be, as it were, convinced that they were a different race.

Of this the most unquestionable proof was their language. It was only with great difficulty and by the aid of signs that one of the Dhangurs, evidently a very intelligent fellow, could make them understand the questions put to them; the result of which was, that they lived a long way off from the Dhangurs in the jungles and mountains, that there were only a few villages of them, and that in consequence of an accident or a quarrel, the man had killed a man of another village, for which his own people were about to deliver him up; in the fear of which he fled with his wife, and after passing a long time wandering in the jungles they had fallen in with my party of Dhangurs who had given them food and had brought them down in their company. This latter part of their story was corroborated by the Dhangur Sirdar, who said, they were nearly starved when his people met with them. The Dhangur who had acted as interpreter said that some of their words sounded "like his talk," and that they understood a good many words of the Dhangur language. All agreed that they had never seen or heard of this people before.

I thought all this so curious, that I told them immediately that I should send them to Calcutta to a gentleman who wished to learn their language and hear about their country, and that they should have good pay and would get some presents. My intention was to send them to my friend and partner G. J. Gordon, Esq. of Mackintosh and Co. for Dr. Abel's inspection, and that of the Asiatic Society; and I never supposed for an instant that this could possibly alarm them and so did not note any exact description of them. It seems, however, that it did so, and that as I suppose the man thought, perhaps, that I was going to send him to prison

for his homicide, which act by the way he explained very clearly to us by signs as well as words, or that they were frightened in some way by the Dhangurs or villagers ; for the next morning it was found that they had absconded ! and I could never hear of them again to my very great disappointment, for I felt, and still feel certain, that they were of a race utterly different from the Coles and Dhangurs, and probably approaching to the Veddahs of Ceylon.

When we recollect that until the Goomsur Campaign, we knew nothing of the extraordinary people inhabiting those jungles, and that it is only since we have had a station at Darjiling that we know any thing of the Lepchas, and recently again to the eastward of the singular people who live on trees in the Chittagong or Tipperah territories.\* When we recollect all this, and that not many years before Lord William Bentinck's government a Civil Servant of high standing, in a public minute, scouted the idea of the existence of Thuggee,† and again in the note from Captain Oakes which I have submitted to the Society‡ when we find that the ruins of the city of Doolmee are within a few miles of the station of Purulia, and yet are only now to say discovered, through a rude legend of a petrified city perseveringly investigated. When we consider all this, then, I hope it will not be thought extravagant to suppose, that we really have a small forest tribe buried somewhere in the vast jungles of the wild country between Palmow, Sumbhulpore and the head waters of the Nerbudda ? and I place my recollection of them now before the Society, in the hope that by giving it publicity, we may direct enquiry to the subject, and perhaps rescue from utter oblivion a remnant of one of the aboriginal races of India who, as to appearance, may well justify the singular myth of Hanuman's aid to Rama in the conquest of Lanka ; which, like all other myths has no doubt a remote foundation in truth, such a one for instance as the tradition that the people who assisted the hero-god in his war, were *like*

\* It was about the date to which I refer above, or later I think, that the Todawurs of the Nilgerries were first discovered.

† I have seen this in one of the early volumes of the Asiatic Annual Register, about 1820, I think, but I cannot refer to it.

‡ Published below : Its publication was deferred in the hope of further particulars from Captain Oakes, after his proposed visit.

monkeys? which would have been perfectly true, if said of the forefathers of this singular race.

Since the foregoing was written (in the month of September last) I have lately obtained, in conversation with my friend, Dr. Falconer, a very remarkable confirmation of the views it sets forth. Dr. Falconer states that when in London he was intimate with Mr. Traill, for many years Commissioner of Kumaon. That gentleman told Dr. Falconer that, hearing from the natives curious accounts of a race of men who, like monkeys, lived in the trees, and who inhabited the depths of the forests of the Terace, he had after much trouble succeeded in having one man brought to him, whose appearance was also most extraordinary and fully justified the epithet of *दन मानुष*, which the natives applied to him. Mr. Traill found him also so excessively timid and alarmed, that though he was desirous of keeping him for a short time, in hopes of inducing him and his tribe to enter into some intercourse with the Residency, he would not detain him; and so giving him some presents he sent him away. Nothing was ever heard of him or of any of his tribe afterwards!

We have thus upon three several points of continental India the indubitable fact (for the account of the Tipperah, or Chittagong, tree-inhabiting race is I think official?) that there are wild tribes existing which the native traditional name likens to the Orang Utang, and my own knowledge certainly bears them out, for in the gloom of a forest, the individual I saw might as well pass for an Orang-Utang as a man.\* What are these singular people?

*The City of Doolmee.*

*Poorolea Maunbhoom, the 15th August, 1854.*

MY DEAR SIR,—With reference to my note of the 21st June last, I have now the pleasure to furnish you with the few particulars

\* Since this was written, I find in Vol. II. of the Journal, page 583, in a paper on the Birds of Borabhoom and Dholbhoom by Lieut. Tickell, the following curious passage. After affirming the existence of the Hippopotamus and of an enormous snake, the writer goes on to say “and lastly from a casual glance, I once caught of an animal in the thick and high woods bordering the Gurum nala near the valley of the Subunreeka, it would be the corroboration of an anxious surmise were after researches to establish the fact that the *Orang-Utang* is an inhabitant of these forests.



which I have been able to collect relative to the ancient city of Doolmee in the Patkoom Pergunnah of this district.

1. Doolmee (not the Doolmee of Tassin's Map) is situated within a mile of the river Suburnreeka, [near the junction of the Kurkurra with this river] and 24 miles South West of Poorolea, and 5 miles N. W. of Eshaghur.

2. The ruins of a Rajbatee or Palace are to be seen at Doolmee : there are also many remains of temples, and images of gods and goddesses.

3. There is an inscription on a temple which is on the top of a hill (the door of which temple has been blocked up) within half a mile of Doolmee, and a few yards of the river—there is another large river near the temple.

4. There are two large tanks, one is called "*Chhatta*" and the other "*Kájál-gowra*" tanks. Chhatta tank takes its name from a large stone umbrella in the middle of the tank, 6 feet above the water, and is near the Palace. Kájál-gowra is said to have been dug within one night for Bhánoomutty, the wife of Bikramáditya.

5. The site of the Palace extends 4 miles, within which are dispersed many images of gods and goddesses, and images of beasts.

6. The city was built with bricks.

7. Raja Bikramáditya is said to sleep at Doolmee, and to bathe at Kutwa, and to hold kutcherry at Mungulkote, and to take his meal at Juggernaut (Pooree).

8. Tradition runs that a large quantity of wealth is buried within the Palace, and the wells adjoining it, which if dug, protecting serpents destroy the diggers ; and when Rájá Bikramáditya was translated into heaven, the inmates of the Palace were petrified.

This is not the season for visiting the spot ; but in the cold weather I shall make a point of going there, and should I be successful in obtaining any further information about the said Doolmee, I will communicate the same to you with great pleasure.

Your's very truly,

G. OAKES.

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*Memorandum on the Kunkurs of Burdwan as a flux for smelting the Iron Ores, and on some smeltings of Iron Ores by Mr. TAYLOR, of that district.—By HENRY PIDDINGTON, Curator Museum Economic Geology.*

The question of Iron Ores and smeltings is just now engaging much attention, and I have therefore thought it of use to publish my recent, and former, examinations of the Kunkurs of Burdwan, which will be found below, and I have been induced to do so by a desire to make known the following facts.

Mr. C. B. Taylor of Toposi Colliery in Burdwan has just sent us a number of Iron Ores from that district, as reported at the December meeting, and with them a small quantity of the nodular Kunkur of the same localities, and on a visit to the Museum, Mr. Taylor also claimed as his work Nos. 41 to 45 of our series of washings and smeltings of Indian Iron Ores, which are specimens of the raw and roasted Burdwan ore, and of the same when smelted; with two spike nails forged from it. What is essential to our present purpose herein is, that Mr. Taylor had fortunately sent with the specimens, the Kunkur which was used as a flux to the ore in his little experiment, which was performed in a rude native built furnace. This little series was presented by Mr. William Prinsep to the Museum of Economic Geology.

I thought it, then, well worth while to examine these Kunkurs of Mr. Taylor's, for if good nail-iron can be produced with the common Kunkur of Burdwan, the question of flux is set at rest until it is exhausted, and it is said to be found every where and in considerable quantities at the surface. The late Mr. Williams in his report says at once, as indeed any English miner would be ready to do, that the Kunkur is too earthy to serve as a flux, and he proposes to send to Sylhet for Limestone, which thus becomes a formidable item in his estimate of the cost of iron from this locality.

Beginning with the most recent specimen, Mr. Taylor's Kunkur of 1854, there are evidently two kinds of the concretion, and they

differ as much as 6 per cent. in their composition. It is difficult to give them names, but we may call the best kind, which is in globular, bullet-like nodules (called I think *Gooties* both in Behar and Burdwan?) the globular Kunkur; and the other which is in somewhat flattened and irregular lumpy concretions the Botryoidal Kunkur.

The following are the analysis of these Kunkurs with reference only to the quantity of carbonate of lime which they contain

						<i>Carbonate Lime</i>
<i>Date.</i>						<i>in 100 parts.</i>
1854	{	A. Globular Kunkur,	..	Mr. Taylor.		62.25.
		B. Botryoidal,	..	.. ..		56.75.
1849		C. Globular .. Flux for the Iron Ore of				
		No. 41,	..	..	to right	50.20.
1826	{	D. a Sylhet Limestone,	..	Piddington,	..	96.50.
		E. Kunkur from Burdwan Crystd.		do.		71.00.
		F. Do. do. do.	do.	do.	do.	72.00.
		G. Do. do. do.	do.	do.	do.	71.50.
		H. Do. do. do.	do.	do.	do.	71.25.
		I. A marly earth..	do.	do.	do.	50.00.

Referring to Mr. Taylor on the subject of his specimens, he has obliged me with the following very interesting notes on his iron experiments and the Kunkurs, which at the present moment are valuable, as shewing what has really been done with Burdwan ores, with only rude native apparatus, and by an unprofessional man.

"It is out of my power to say whether the specimen of iron presented to the Asiatic Society by Mr. William Prinsep, and made by me up here was smelted with coke or charcoal. To the best of my recollection I sent several cart loads of the cast iron, made in several experiments, both with charcoal and coke, and which of these he gave to the Society is more than I can tell. I have, however, preserved a memorandum of three experiments made with coke, and three with charcoal, which I enclose. These experiments were principally made with the red ore of Sheargur, but in some of the experiments I either mixed, or tried separately, some of the red gravel magnetic ore, a specimen of which I have already given you, although not from the same locality. The red gravel ore which I

gave you in May last, came from the North of the Adji river. What I tried up here in 1837 or '38 came from the South of the Damoodah. I really forget whether the experiments above referred to, were made in the cold season of 1837 or '38, my memorandum does not state which, it was however either one or the other. Observe in the memorandum, that it took 36 maunds of charcoal, with 20 maunds of ore to make 8 mauuds, 20 seers of cast iron, and that it only took 14 maunds of coke to make 9 maunds, 23 seers of iron. This is of great importance, for although charcoal may be had up here, coke would be the most economical fuel to use in smelting. With some of these experiments, I used Kunkur lime and which I recollect greatly assisted in the fusion of the ore, but unfortunately I have not preserved any memorandum of the proportion of Kunkur used, I think the first experiment was made with the red ore of Sheargur, and which is found lying over the clay iron stone, as well as the coal measures. I think you call this ore in something that you have written about the ore of this district in the Journal, "red ochre ore." (Red ochry iron ore of Jameson. Researches, Vol. XVIII. H. P.)

I really cannot give a decided opinion as to the quantity of Kunkur to be found in this part of the world. I have never found any scarcity of it. In some places, the deposit, however, is only superficial, but in some places it is found deep in the ground. I know several deep deposits; not only in this purgunnah, (Sheargur) but in the neighbouring ones also. Whether there is sufficient Kunkur to supply a number of blast furnaces, and for how long a period, cannot be ascertained without a search being made for that purpose alone. But I am of opinion that in the first instance a number of blast furnaces might be easily supplied, a large consumption would however soon make it scarce, but the neighbouring purgunnahs might continue to supply it for a long period of time."

*Table referred to by Mr. Taylor.*

Experiments made in smelting the iron ores of Sheargur, with Charcoal and Coke, in the cold season of 1837 or 38.

Ore.	Charcoal.	Coke.	Iron.	Per Cent.
29 Maunds....	36 Maunds.	.....	8 mds. 20srs.	42 pr. ct.
29 ... " .....	32 ... " .....	.....	10 " 20 "	36 $\frac{1}{5}$ "
26 ... " .....	25 ... " .....	.....	8 " 20 "	32 $\frac{2}{3}$ "
19 mds. 20srs.	.....	18 mds. 20srs.	3 " 25 "	18 $\frac{1}{2}$ "
28 maunds. ...	.....	17 " 20 "	7 " 8 "	25 $\frac{1}{2}$ "
27 maunds. ...	.....	14 " 0 "	9 " 23 "	35 $\frac{1}{2}$ "

In some of these experiments, a mixture of red gravel ore, highly obedient to the magnet was used, and likewise Kunkur or Nodular lime-stone, but I have not preserved any memorandum of the proportion of either, or in which experiment they were used.

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*Notes on Eastern Thibet.—By Dr. A. CAMPBELL, Superintendent of Darjeeling, (with Sketch Map of Route to Lassa).*

This opportunity is taken of publishing a sketch map protracted some time ago by Major Crommelin, it will enable the reader to understand readily the position of the principal places mentioned in Dr. Campbell's Notes.—Ed.

Having lived many years in the Eastern portion of the Himalaya, viz. in Nepal and Sikim, and visited the Bootan Dooars or Lowlands annually for eight years, I have had many opportunities of becoming acquainted with the natives of Thibet, who visit these countries and the plains of India to trade, and on religious pilgrimages—I have also travelled over the whole of Sikim, and penetrated a short way into Thibet in that direction.\* It is from these people, and on those excursions that the substance of the following Notes has been collected by a good deal of laborious questioning, and in the course of official business. I am familiar with the writings of Turner, Hue, and others on Thibet, I have not used them, however, to correct these Notes, nor do I wish to substitute my own information for any portion of these published accounts. My only aim is to add a little to the scanty knowledge we now have of Eastern Thibet; and I shall be glad if I have not quite failed in my purpose.

\* With Dr. Hooker in 1849.



Thibet is reckoned by Gutzlaff in his 'Life of the Emperor Taou Kwang,' page 227, to comprise an area of 30,200 square miles; and to have a population of about six millions. Thibet, as thus indicated in the enumeration of the dependencies of China, embraces, I believe, Little Thibet or Balti, the capital of which is Iskardo; Western Thibet the principal town in which is Leh, and Thibet Proper or Eastern Thibet, having Lassa as its capital and chief city.

The latest and best account of the Trans-Himalayan regions, is 'Dr. Thomas Thomson's Travels,' published last year in London.

Following Humboldt, Dr. Thomson divides Thibet into two grand divisions; the western one, of which he treats so ably himself, and the eastern one, to which alone my Notes refer. Western Thibet—according to Dr. Thomson "is a highly mountainous country, lying on both sides of the Indus, with its longer axis directed like that river, from south-east to north-west. It is bounded on the North-east by the great chain of mountains, to which Humboldt, following Chinese geographers, has given the name of Kounlun, by which it is separated from the basin of Yarkund. On the south-east, its boundary is formed by the ridge which separates the waters of the Indus from those of the Sanpu." "To the north-west and south-east," continues Dr. Thomson, "its boundaries are somewhat arbitrary, unless the political division of the country be had recourse to, which, depending on accidental circumstances, entirely unconnected with physical geography or natural productions, is so liable to change that its adoption would be extremely inconvenient. The best mode of drawing a line of separation between India and Thibet, in those parts where mountain chains are not available for the purpose, appears to consist in regarding the latter to commence only at the point, where the aridity of the climate is too great to support forest trees, or any coniferous tree, except juniper."

"As limited by these boundaries, Western Thibet includes the whole valley of the Indus, and its tributaries down to about 6,000 feet above the level of the sea, a considerable portion of the upper course of the Sutlej down to between 9,000 and 10,000 feet, and small portions of the upper course of the Chenab, of the Ganges (Jahnavi) and of the Gogra."

The above is a very elaborate definition of boundaries, founded



An attempt to protract  
 Dr. A. Campbell's route from Darjeeling  
 to Lassa, the Capital of Thibet, as given  
 in the Journal of the Asiatic Society for April 1848.

(signed) J. A. Brommelen  
 July 3<sup>rd</sup> 1848.

Copied by M. Clements





mainly, as regards the limits of India and Thibet, on the geographical distribution of plants. By it the Himalaya, so well known to Dr. Thomson, is annihilated as a mountain chain. The Kounlun however, which no body knows anything of, and which may be quite as frequently cut through by meridional rivers as the Himalaya, is admitted to that distinction.

I shall now endeavour to describe the second grand division or "Eastern Thibet." It is by all accounts an exceedingly mountainous country, i. e. it contains immense masses and ranges of the most rugged mountains in the world interspersed with extensive plateaus and deep level-bottomed valleys along the streams and rivers.

The Thibetans I have met with, do not recognize a continuous chain of mountains running parallel to the Himalaya; nor are they acquainted with "Kounlun" as the name of any mountain range. They are familiar with the Himalaya on one hand and call it "Kangri" which simply means *Snowy region*, and they know that the country of the Mongols, or Mongolia lies parallel to it on the other hand. The third great distinguishing feature in the physical geography of Eastern Thibet is the Yaroo river or Sanpoo of our maps. Thus characterised, I shall say that in popular estimation—which is not founded on the physical features of the country, on its natural productions, or on political divisions of territory, separately or jointly—Eastern Thibet is bounded on the north-west by the Kangtisee range of mountains,\* and a greatly elevated tract of country extending from the base of this range; on the north by Mongolia; on the east by the Sifan and Sechuen provinces of China, and on the south by the Himalaya, from the point at which it is pierced by the Burampootur on the east, to the meridian of the Mansarowur and Rawan Rud Lakes on the west. The general direction of the Kangtisee range is north and south, and it is said to connect the Himalaya and Mongolia, as by a cross-bar. It runs to the east of the Mansarowur and Rawan Rud Lakes, its highest point is said to exceed in elevation any portion of the Himalaya, and four large rivers have their sources in different parts of the range, viz. the Singh Khawab or Indus, the Langehoo Khawab which

\* The highest portion of the "Kangtisee" range is I believe the "Kylas" of Strachey.

runs through Ladak, the Marchace Khawab which is known as the Gogra, and the Tamchoo Khawab or Yaroo, the great river of Eastern Thibet.

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*Government of Thibet.*

In the city of Lassa,\* and over the whole of Thibet "Geawa Remboochi" or the "Grand Lama" is nominally the Supreme authority, in temporal and spiritual affairs. His residence is in Patala Goompa which is on the north side of Lassa.

There are two Resident Envoys from China called "Ampas" stationed at Lassa; subordinate to them are two great officers—Chinese—designated Daloo-he: their rank and occupation are those of general officers. Next to these are two Phopuns who act as Paymasters of the Troops, and perform the duties of our Adjutant and Quarter Master Generals. They are also Chinese. One of the Daloo-hes, and one of the Phopuns are generally stationed at Digarchi. These officers constitute the general staff of the army in Thibet. Next in rank are three Chong-hars. They are Chinese, and Military Commanders; one is generally stationed at Digarchi and another at Tingri near the Nepal Frontier of Thibet. Below these are three Tingpuns, non-commissioned officers—also Chinese. There are no other Chinese military officers in Thibet. The usual number of Chinese Troops, all Mantchoo Tartars, in Thibet does not exceed 4,000 men. Stationed at Lassa 2,000, Digarchi 1,000, Giangtchi 500, Tingri 500.

The above shews that the Chinese functionaries in Thibet are Political and Military officers only.

All the Civil appointments are held by Thibetans. The local temporal Government of Thibet is composed as follows. It is headed by the Grand Lama entirely guided in all Political and Military affairs and mainly so in Civil affairs by the Chinese Ampas and the Emperor of China.

\* M. Huc says, that "Lassa" in the Thibetan language means, "Land of Spirits." The Mongolians on the same authority call this city "Monche-dhot," i. e. Eternal Sanctuary. My friend Cheboo Lama gives the following interpretation, "L'ha" means God, "Sa" abode or resting-place. Hence it is the city of God, or the Eternal city.



The first officer is the Chemeling, the second Kandooling, the third Tengeling; they are all Thibetans and the Chief Lamas—Awataris—of Goompas\* bearing those names. From these three Lama Counsellors, the emperor of China nominates the Noume-hen,† “Nome Khan” of M. Hue, who may be called President of the Council, or Prime minister. He is Regent when the Grand Lama is a minor, and at all other times is the alter et idem of his holiness. The Noume-hen is always one of the three Great Lamas above named. At his death, or removal from office, he is succeeded in the Noume-hen’s office by one of the two remaining counsellors, always however under orders of the emperor. His successor as head of his Goompa must, as in the case of a “Grand Lama” be an awatar, i. e. he must re-appear in the flesh as a child, and be raised to that position.

Of equal rank with the Noume-hen, but having no temporal authority, is the Genden Tapa Lama, he is next to the Grand Lama himself the highest clerical authority. He is finally appointed by the emperor, being in the first instance chosen on account of his superior attainments and sanctity by the local authorities. He is chief of the great monastery of Genden. The persons privileged to take a part in the selection and recommendation of the Genden Tapa, for his holy office are the Noume-hen, the two Ampas and the four Shapees. They propose him for election to the Grand Lama, after his approval, the Ampas procure his appointment from the

\* Principal Goompas at Lassa and its vicinity.

|                          |       |                               |
|--------------------------|-------|-------------------------------|
| Genden Goompa, . . . .   | 3,500 | Lamas resident and itinerary. |
| Leea, . . . . .          | 5,500 | „                             |
| Depoong, . . . . .       | 7,500 | „                             |
| Gentoo, . . . . .        | 500   | „                             |
| Grume, . . . . .         | 500   | „                             |
| Chenamge, . . . . .      | 1,000 | „                             |
| Chalang, . . . . .       |       |                               |
| Chemchung, . . . . .     | 200   | „                             |
| Kandooling, . . . . .    | 200   | „                             |
| Tengelling, . . . . .    | 200   | „                             |
| Chechooling, . . . . .   | 300   | „                             |
| Moujida Taching, . . . . | 1,000 | „                             |

† Gealchup Noume-hen is the proper title which being translated is “the image of Grawa” or the Grand Lama.

emperor. The Genden Tepas, is chief Lama of a Goompa, but not an awatari Lama.

Next in rank and power to the Noume-hen are the four Shapees. They are not Lamas, always Thibetans, and the principal executive officers of the Government in the Financial, Revenue and Judicial Departments. These departments are not separated and under distinct officers. The Shapees are the highest Judicial officers in the Civil and Criminal Courts. Next to the Genden Tepas is the "Lama Yeungjing" the private guru, or high priest of the "Grand Lama." He is also appointed by orders of the emperor, and is sometimes an awatari Lama, but not always. His office is to teach and train the Grand Lama in childhood and youth, and lead him, if he can, afterwards. This is indeed an important personage in the Bhuddhist world, being no less than the keeper of the Grand Lama's conscience. The nomination to this post being in the hands of the emperor, furnishes an interesting clue to the extent of the imperial power over the church of Thibet.

The Che kap kempu Lama is a churchman of great influence in the Government. He appears to represent the Grand Lama in the council of state and in the deliberations of the Shapees. He may be called Secretary or Minister for the church, and the Shapees may, correctly enough, be called the Financial, Judicial, Revenue and Home secretaries or ministers.

The Treasury is managed by two officers named Jhassas; both are Lamas, and act conjointly, although one of them is Treasurer on behalf of the "Grand Lama," and the other on behalf of the Noume-hen or temporal estate. They are assisted by two Sub-Treasurers styled Shangjotes. Four officers designated Da-puns are the commanders of the Thibetan Troops, and act as Civil and Political Commissioners on occasions of Frontier or other disturbances, they are Thibetans, and not Lamas. The ordinary course of official promotion is from a Da-pun to a Shapee; of equal rank, to the Da-puns is the Che-pun who is however a Civil officer and acts in all Departments as Deputy to the Shapee.\* This officer is often employed as Commissioner on Deputations in Civil affairs either Judicial or Fiscal,

\* Shete Shapee is the energetic Commander-in-Chief of the Thibetan army now opposed to the Nipalese under Jung Bahadoor.

and all the cases sent up by the Police for trial before the Shapees are forwarded through this officer. All appointments to the offices above noted, require the confirmation of the emperor.

1. *Tinkpun*—Superintendent of Police and Jails.
2. *Sherpankpa*—Assessors to the Superintendent and to act as checks on his proceedings.
3. *Boopun*—Military officers subordinate to the Da-puns but also employed in Civil affairs when required.
4. *Jongpuns*—Collectors of Revenue and Magistrates in the interior. They hold office generally for three years only. They are all laymen, one of these officers who is employed in the district of Gar known to us as Gartope, is named the Garpun. He has charge of the salt and gold-diggings in that direction both of which are valuable. In the Kampa country to the East of Lassa, these officers are styled Markam teje.
5. *Giapuns*—Subordinate Military officers, Non-commissioned.
6. *Dingpuns*—Ditto, ditto.
7. *Choopun*—Ditto ditto. Privates are called Ma Mi, which means "fighting men."

The patronage of these 7 classes of officers nominally lies with the Gealchup Noume-hen, but the Chinese Ampas have a veto if they desire to exercise it, and the working of the system is to procure the approval of these high officers to the appointments before they are made.

One of the Ampas annually visits the Nepal and Ladakh frontiers.\* The Noume-hen and the four Shapees have the entire control of the land assessment, commerce, customs and other sources of revenue, and, I believe, that no account of the revenues, or the disbursements of Thibet are required by the Emperor. The Chinese Troops and

\* In 1846, Keshen was the only Ampa or representative of the Emperor in Thibet but he was one of the eight Tongtongs of the Empire and specially deputed to arrange Thibet affairs at that time and the usual system of two Ampas was then suspended. The following anecdote of Keshen is very characteristic of the self-deceiving system of the Emperor's Government. When Keshen was ordered to be executed for having sold the interests of his country to the English during the War, his life was spared at the entreaty of "Sac Lama" the friend of the Emperor "Taokwong" and sentence of banishment in chains was substituted. Subsequently

all the Chinese officers in Thibet are paid by China and in money; the Thibetan Troops by assignments of the Government share of the land tax. There is no money Revenue sent to Pekin, an annual Embassy with presents only in cloths, images, books, incense, &c.

There is a fund in Patala Goompa to which 100,000 rupees is added annually. Never opened except in time of great war expenses, it was opened to repel Zorawur Singh the Sikh General, who invaded Thibet from Cashmere in 1842. The Ampas pay is 140 Rs. per day, and he gets large presents while travelling in Thibet.

A Shapce's pay is 140 Rs. per mensem from China, and he has lands and other emoluments from the Grand Lama.

### *Army.*

They have no Artillery in Thibet; the Cavalry so called is mounted on ponies; the principal troops are Infantry and great pains are taken to make them good marksmen. Prizes and promotions are the invariable rewards of good marksmen. The Chinese or Tartar troops are kept quite distinct from the Thibetan ones, which are only a Militia called out when required, and not regularly paid. The Imperial Troops quartered in Thibet do not exceed 4,000 men, and the Thibetan force is not so strong. There are 2,000 Imperials at Lassa, 1,000 at Digarchi, 500 at Giangtchi, and detachments at Phari, and Tingri. The last named post, is on the high road from Cathmandu to Lassa, and is situated on a Plateau called the "Tingri Maydan" by the Nepalese. The Imperial troops are armed with long matchlocks, to which a rest is attached. The Thibetans have very few firearms, being provided with bows and arrows, and short swords. The powder is of a very inferior description, and it does not appear that the troops are ever practised in military manœuvres.

at the urgency of the same Lama, Keshen was appointed viceroy to Thibet. Affairs at Lassa, and throughout Thibet were in great confusion at the time; three Grand Lamas had died by poison in a few years and the Noume-hen was suspected of the crime. Keshen had the opportunity given him of redeeming his fame, and he did so by re-establishing order in the country, and convicting the Noume-hen. It is a curious fact, however, that he proceeded from his banishment in Manchouria to his Government at Lassa *in chains*, that is to say, he wore a gold chain, the badge of punishment round his neck, concealed by his garments, nor was it removed, and his forgiveness complete until after he quitted Lassa as Governor of Sechmen.

*Personal Habits, Customs and Ceremonies of Thibetans.*

The Thibetans of the higher class wear Chinese satins in the warmer seasons, and the same lined with fur in the cold ; all others, male and female, wear woollens in the warm, furs and sheep skins in the cold weather, and never go about without boots. The men do not go about armed. The common people never wash during the cold season ; very sparingly at other times. The reason given for this being that the skin of the face cracks and ulcerates from the cold, if water is applied to it. The people of towns, who do not go much outside the house, wash occasionally, but the universal prejudice is strong against ablutions of the person, and it is equally extended to their clothing which is worn in a filthy and greasy state.

Soap is high priced and little used in Thibet ; it is not manufactured there. The supply is from India, through the Cashmere traders viâ Ladakh, and from Nepal. A small quantity also goes from Bengal through Bootan and Sikim. There is a grass in the country or a plant like grass, the root of which pounded with water, makes a lather and is used for washing clothes.

Travelling in the winter and indeed generally is performed on yaks. The women ride astride on them like the men, and they are so masculine and dressed so much alike that it is difficult to distinguish between them.

A Thibetan village or town is never surrounded with filth, as in India. To every house there is a privy, and the contents are carefully preserved for manure. In some situations, where the soil is suitable, saltpetre is made from the earth about the privies, but the regular supply of this article, which is used for making gunpowder only, goes from India.\* In towns the contents of the privies are sold annually, and those of people of wealth sell highest.

It is well known that the dead are not burned or buried in Thibet, but exposed on high places to be devoured by vultures. For this business there is a class of men who make it their sole vocation. They

\* At the time of the Sikh General, Zorawur Singh's disastrous incursion from Ladakh into Thibet as far as Gartope, 1842, there was a good deal of saltpetre taken into Thibet through Sikim, also sulphur and lead bullets.



are called "Raga Tongden;" they are a low race held in dislike and shunned, but they are generally rich. They go about to the living, begging and extorting money. When refused or ill-treated, they retaliate with abuse which is often successful. "Very good," say they, "you won't give us alms now, you will come into our hands some day, and we will put a rope round your neck, drag your body through the streets, and throw it to the dogs," and the latter part is the frequent fate of the poor man's body, as these men keep numerous dogs to devour the bodies.

The bodies of the wealthy are carefully disposed of; they are carried in a litter to the top of a hill, set apart for the purpose, the flesh cut in pieces, the skull and bones pounded in a mortar, and when all is ready a smoke is raised to attract the vultures, who collect in thousands to eat it up.

The Chinese have spacious burial grounds at Lassa, and Digarchi, and there, as in their own country and wherever they reside, they are well cared for and ornamented. The Lassa one is said to contain 100,000 tombs. In the time of Wanhg, a celebrated Raja of Lassa, there was an insurrection against the Chinese which ended for the time in the annihilation of the whole army, and the massacre, by the Thibetans, of the whole Chinese population. The funerals of the Chinese at that time were estimated at 4,000. This massacre was punished by the Emperor with signal vengeance, and since that time the Chinese supremacy has been finally established all over Thibet. There was a petty insurrection in 1843, in which many Chinese were killed.

### *Religious Festivals.*

There are twelve great annual Festivals, viz. Bunteung, Kansupecha, Chúchupecha, Gesúpecha, Nesúpecha, Gosúngpecha, Gyajeepecha, Lallúpecha, Chindúpecha, Dúdúpecha, Kagyurpecha, Lukphopecha. Pecha is equivalent to Pujá.

On the anniversary of the death of a Chief Lama of a Goompa, there is a great festival and illumination. At Tashi Lumbu, three such are held annually.

The "Lassa Morun" festival of M. Huc is properly called the "Lha-sa Meuhlum." It is the anniversary of the first proclamation the Religion of Boodha by Sakya, at Lassa.

N<sup>o</sup> 1.

ॐ नमः शिवाय ॐ

佛陀彌阿無南

No 2

५५

ॐ नमो भगवते वासुदेवाय

ॐ मणि पद्मे हूँ

ॐ नमो भगवते वासुदेवाय ॥

N<sup>o</sup> 3.

1. ለጥያቄዎቼ ጥሩ ምላሽ ሰጥተዎታል።  
 2. ለጥያቄዎቼ ጥሩ ምላሽ ሰጥተዎታል።



*Seasons.*

The year is divided into four Seasons. First Chid, or early Spring, February, March and April. Second Teuh, or Spring proper, May, June and July. Third Yirrh, or Rains, August, September and October. Fourth Gunh, or Winter, November, December and January. Some showers and southerly winds occur in Chid. In Teuh, it is temperate and dry, but showers, thunder and lightning\* occasionally prevail. In Yirrh, there is constant but not heavy rain and hail in September and October. Frost begins early in November and increases all through the winter. Heavy falls of snow are rare except on the mountains.

*Soils.*

Only three kinds of soil are recognized ; a blackish one, a reddish one which is described as rather clayey, and a greyish coloured one, which is also clayey and contains a good deal of sand. The last is found along the beds of streams and yields good crops. The reddish soil is also fertile ; it frequently contains gravel and stones ; it is the prevailing soil in the tract called Dingcham, which extends along the northern face of the great Himalayan chain from Tawang to Keroong, but this region is quite barren. Mean elevation 16,000 feet at least. The blackish soil most abounds in the districts or provinces of U and Chang ; it is the most fertile of all, but also contains stones and gravel.

The fertility of the culturable soil is highly spoken of, and 40 to 50 fold in wheat is considered the average. Crops are generally very certain, and blights or other accidents rare. Early frost sometimes overtakes the harvest and spoils the grain, when the grass is at the same time burnt up, and this causes scarcity and famine. It is then the granaries are opened, and the corn-merchants make their fortunes. There is no interference with the price of grain. It is always dear compared with India, but varies considerably ; and the principal cause of scarcity appears to be the early setting in of

\* In 1845, a great earthquake was experienced in the Province of Kham north-east of Lassa. It was most severe in the district of the Dirgi Raja. About 3,000 men were killed, and a Goomba destroyed by the opening of the earth.

About 20 years ago, the district of Kompo in the Province of Kham was visited by a severe shock ; one village was destroyed by the opening of the ground.

frost. This is said to be induced by continued clear nights which are greatly dreaded in harvest time.

*Agriculture.*

Wheat, barley and other crops sowed in April and May are reaped in September and October ; all are irrigated. The peach ripens at Lassa in October and November. It is sun-dried and preserved. No grapes are grown at Lassa. The whole supply of raisins is received from Ladakh. The plough is used in all old cultivations : yaks, bullocks and ponies occasionally are trained to it. The plough is the same as the Indian one, made entirely of wood, except the sock which is pointed with iron. Timber for ploughs is imported from Sikim and Nepal. Rhododendron Hodgsoni, and birchwood make the best ploughs. Cultivation in fresh lands is done with the hoe. The Thibetans do not use a harrow, the grain being covered in with hand.

Barley in Thibet takes the place of potatoes in Ireland ; four-fifths of the population live on it.

Neither wheat, barley nor peas will come to maturity as a paying crop in any part of Thibet without irrigation, and the water flooding of the fields, by which they derive a fertilizing effect from the frost, is equally necessary to prepare the soil for these crops. Wheat requires three or four irrigations or waterings from the time the seed is sown till the ear bursts, after which it will ripen without further watering. The flooding of the lands in winter, and watering of the crops in summer are principally effected from drains or canals cut from the rivers : very little watering is performed from wells. The whole of the arable lands along the Painom river and the most of it on the Yaroo Sanpoo are terraced and have maintaining walls of stone raised a little above the surface of the fields. Great pains are taken for the equable distribution of the water by running it off from terrace to terrace, and it is applied from leather bags when it cannot be brought to run on particular spots. Watering freely is indispensable to all crops in Thibet. The atmosphere is so dry and the soil so destitute of moisture, that without it the sun burns up the crop before it comes to ear. In a land of so little rain and with an atmosphere so dry and sun so scorching as to render irrigation and free watering indispensable, the questions which naturally arise are, What extent of area can be watered from the rivers by canals and



drains? and Is there more arable land in Thibet, than admits of being irrigated from the rivers?

To answer the first question, it would be best to refer to the statistics of the Nile irrigation, in illustration of the extent to which land on either side of a river may be irrigated by artificial means, not by the overflowing of its banks which is not usual by the Yaroo of Thibet, and is therefore not be taken into the comparison. I have not the means of making this comparison. But to reply to the second question I have taken much pains to collect facts, the most prominent of which are as follow:—

1st. The culturable land on either bank of the Painom river, from its source to Digarchi, has not a maximum breadth anywhere of more than four miles, i. e. eight miles in all for the extreme breadth. In many places however, the river is closely confined by mountains.

2nd. From Digarchi to Giangtchi on the Yaroo one day's sail, the culturable land on either side the Yaroo varies from two to four miles.

3rd. From Giangtchi till the Yaroo escapes from the Kambola range, its course is exceedingly tortuous, generally through great mountains, and it has but a very narrow bed of culturable land in a few places. It is closely pressed in by great mountain ranges in the Kambola district, and elsewhere in this portion.

4th. I allow the utmost extent of culturable land ever given to me by an informant for the Yaroo valley from the point at which it leaves the Kambola range entirely to the junction of the Kechoo or Lassa river; and that is a total breadth both banks included varying from 20 to 40 miles. There is more flat land on the South than on North bank of the Yaroo.

5th. The Kechoo River is closely hemmed in by mountains on the Eastern bank; on the Western bank it has a belt of about 4 miles of culturable land only.

These particulars will afford some assistance for reckoning the culturable area of the finest part of Eastern Thibet, and will shew it to be very small indeed, compared with the total area of this rugged country, and it is universally asserted that the land is everywhere dependent on river irrigation for its fertility. On this subject M. Hue says "Poulon, fine purple cloth, scented sticks and wooden

bowls are the only good manufactures, neither is their agricultural produce remarkable. Thibet, being almost all covered with mountains and intersected by impetuous torrents, furnishes its inhabitants with but little soil suited for cultivation, the valleys alone can be sowed with any prospect of reaping a harvest." When the Yaroo does overflow its banks, the sediment it leaves, is fertilizing. The Yaroo soil deposit is generally light and sandy.

Three feet of digging brings you to the water at Digarchi which stands in the flat and low Delta of the Painom and Yaroo rivers. 20 feet is required at Kambajong.\*

Many Thibetans believe that the Painom rises in Sikim, but its sources are no doubt, as given by Turner, in the vicinity of the Ramchoo Lakes, north of Phari. A horse Dak is four days from Digarchi to Lassa, a boat by the Yaroo takes 12 days to the disembarking place, nearest to Lassa. It is 12 days' journey to the Salt Lakes from Digarchi, due north.

#### *Crops, Rotation of, &c.*

The number of crops is very limited; wheat, barley, buckwheat, peas, turnips and a little mustard, comprise the whole. There is no regular rotation observed. As in India with all crops, so it is in Thibet. Wheat is grown for generations in the same ground varied, in some places, by barley or buckwheat; about three times as much barley being grown as wheat. All the suttoo eaten with tea is roasted barley, and this may be considered as the staple article of food for all travellers. See M. Huc *passim*.

At Digarchi, Giangtchi, and generally in the Province of Chang or Tsang, grain is more plentiful than in the neighbouring province of U; in the former 10 to 15 seers, (20 to 30 lbs.,) of wheaten flour per Company's Rupee is reckoned cheap, and in the latter about half the quantity is so.

The dung of animals is so much in request for fuel, that scarcely any is used for manure, nor is there any spare fodder or other vegetable matter available for composts. Human ordure and ashes are therefore the principal manures in use; both are carefully preserved, and very valuable. In the towns the contents of public privies are a source of revenue to the Government, and lodging-houses have

\* Kambajong a Police Station in Dngcham. See Hooker's Himalayan Journals and Map.

privies attached to them which are most jealously watched. The contents of these places are removed by a class of people who principally live by the occupation, and are the filthiest of all the population, which is everywhere and in every grade, very dirty. They work with their hands at their vile occupation and in the middle of it unwashed may be seen drinking hot tea, and eating raw and sun-dried flesh close to the piles of ordure. Ashes are mixed with the ordure, and this is reckoned the best of all manures. Liquid manure, (ordure with water,) is also in use, but sparingly. This mode of using manure is probably taken from the Chinese.

Scarcely any weeding is required, as the crops grow nearly free of all weeds. When necessary, it is done with the hand, the weeds being carefully preserved for the cattle.

The Thibetans reap with an untoothed sickle, the crops being all cut close to the ground to save the fodder. Wheat is tied up in small sheaves and stocked on the ground, or in yards near the houses. The corn is beaten out by the flail as in Europe, the women taking a part in the threshing with the men. This is done with great care, so that not a grain is lost. There is also a kind of hackle used for beating out the corn. A beam 8 or 10 feet long toothed with iron spikes, through which the sheaves are drawn. The winnowing is performed in the open air.

The grain is ground into meal by watermills. In some villages, mills are built by subscription, and the parties use them in turn. There are public mills also. The millers in these take one part in 20 as payment. There is a great press at the mills for two months after the harvest, when they are going day and night, as frost sets in in November so hard that they cannot be used again till the spring. There are no windmills in Thibet I believe, although in no country in the world, I believe, is there a more steady wind in the cold season, than here.

#### *Wages of Labour.*

A Chinese soldier is very highly paid in Thibet, i. e. he gets as much as 12 to 16 Company's Rupees per mensem. The Thibetan soldier has no regular money pay. He is allowed the Government share of revenue on a portion of land, his own farm or another, and this does not exceed 40 or 50 Company's Rupees per annum.

Masons, carpenters and other artificers can earn from 8 as. to 1 Rupee a day in the towns; common labourers three and two annas. Gold and silversmiths are highly paid, 8 as. in the rupee for fine work is the usual rate.

### *Breads, &c.*

The bread is all unleavened, and cooked on heated stones or grid-irons. The poorer people make their bread with coarse wheaten flour and water, the better classes with fine flour and butter. The latter description I have eaten; it is a sort of heavy biscuit, made in a long twisted loaf-like shape. The sweet and pure farinaceous taste of the fine flour of Thibet equals the best Cape or American flour. Rice is only eaten in Thibet by the Chinese, and the richer Bhotias. The whole supply is received from Bootan and Sikim. The Thibetans do not cook and eat it plain as the Indians and Chinese do, but make it up into large balls with butter and sugar using it as a pudding and sweetmeat. The staple food of the country is "Champa," called Suttoo in India; it is finely ground flour of toasted barley. It is universally eaten and without additional cooking, and is excellently suited to the people of a country which is so ill-supplied with fuel. Mixed up with hot tea and formed into solid balls, it is called "Paak." Prepared with lukewarm water, it is called Sen. Travellers often carry the "Paak" ready made in skins, and eat it as they go along, but if it is possible to get fuel, they prefer making a jorum of tea, and having the paak warm and fresh. The Thibetans are great eaters when they are in plenty. Tea is drunk at all houses, and at every meal, and is regularly used four times a day, i. e. in the morning early, about 8 A. M., at noon, and in the evening. For breakfast which is always eaten at daylight and before washing of hands, face or mouth, the favourite dish is Tookpa, a sort of broth, made with mutton or yak's flesh, Champa, dry curds, butter, salt and turnips. This is eaten without bread, and followed by a cup of scalding tea. They never drink tea when it is the least cold, and if a foreigner allows his cup to cool and then drinks it, he is considered a very careless fellow. An attendant is always on the watch when tea is being served, and as you proceed, he replenishes your cup with a ladle or from the hot teapot until you cry "Hold, enough," or

empty out your cup, and put it in the breast of your cloak, the usual receptacle of many necessities to a Bhotia. The snuff bottle, thick woollen nose cloth, tea cup, bits of dried flesh, &c. are all huddled here, without remorse, and it is a most filthy receptacle.

*Salts, Minerals, Metals, &c.*

1st. *Peu*, a carbonate of soda, is found all over Dingham and Thibet, south of the Yaroo; it appears as a whitish powder on the surface of the soil, never in masses under ground. It is not used to make soap or otherwise in the arts, a small quantity is always put into the water with tea; it is considered to improve the flavour, and it gives a high brown colour to the decoction. It is generally used in medicine.

2nd. *Chulla*, Borax. I cannot learn that borax is produced in any part of Thibet south of the Yaroo river. The general direction of the Yaroo is easterly. It is largely imported into Digarchi, whence it is distributed to other parts of Thibet and to India via Nipal, Sikim and Bootan, whence it finds its way to Calcutta and Europe.

3rd. *Sicha*, Saltpetre, is produced generally in Thibet and manufactured at the large sheepfolds where composts of sheep's dung and earth are formed to produce it.

4th. *Moghce*, Sulphur, is not found in Thibet. India exports this article for consumption at Lassa where gunpowder of good quality is made. The charcoal of the poplar—(changma,) and of the willow—(langma,) are considered the best for gunpowder, and this is fortunate, as these two trees alone attain to any magnitude near Lassa.

5th. *Lencha*, common Salt. Three sorts are known in commerce.

1. *Sercha*—White and best.

2. *Cháma*—Reddish and good.

3. *Pencha*—Yellowish and bad, contains soda or magnesia and earthy matter.

All the salt consumed in eastern Thibet is the produce of lakes or mines situated to the north of the Yaroo river, or comes from "Lache," a district lying between Digarchi and Ladak, which is traversed by the Yaroo. The best information procurable is to the



effect that all the salt of Thibet is the produce of lakes; still there are people who assert that it is also dug out of the ground. Possibly this is confined to the vicinity of the lakes or to their dried margins. All travellers in Thibet are agreed that the salt-producing districts are the most rugged and inaccessible that can be imagined. It is quite true that men and sheep only can reach the salt deposits. It is also true that the elevation of the deposits prevents their being worked, except for the warmer half of the year, April to November. Thousands of sheep are employed in carrying the salt from the deposits to places accessible to yaks. These latter animals carry it all over Thibet in loads up to 160 lbs. Sheep in open places will carry 20 to 24 lbs.: in the vicinity of the deposits the ruggedness is so great that 8 to 10 lbs. is as much as can be safely put upon them.

Snow falls annually after November in the salt-producing tracts and covers the ground for two months or more. The elevation of these places cannot, I believe, be under 22,000 feet.

At Digarchi, 1st quality, 2 Rs. per maund, or 20 lbs. for 1 shilling.

At Giangtchi, 20 per cent. dearer. At Lassa, 5 Rs. per maund, or 8 lbs. for 1 shilling.

These prices indicate the relative distances of the places named from the salt districts. There are no available means of ascertaining the actual distances. Digarchi, the nearest mart may be twenty days' journey on horseback from the nearest salt lakes. See annexed Route No. 1, of 55 marches for loaded men. (p. 334.)

It is believed that salt is now in course of being deposited in a lake at Tinke in Diugcham—near one of the sources of the Arun river, but it is not worked, and great pains are taken to conceal the fact, as there is a prophecy that whenever salt shall be found in the lakes of Dingcham, the glories of Thibet shall be on the wane; which means that a rush shall be made from all sides for the salt which will render the exclusion of strangers ineffectual. Salt is given to sheep and cattle in Thibet, but not to horses.

6th. *Doh so*, which in the Thibetan language means "Stone charcoal." Coal is nowhere found in Thibet. It is known in that country as a produce of China which is seen at Siling, and other marts on the Thibetan confines of China.

7th. *Ser*, Gold ; is found in the sands of a feeder of the Yaroo which joins it on the Northern bank. The name of this river is not known to me, but it flows from a country called “Shapduk” and falls into the Yaroo to the west of Digarchi. The greater part of the gold of Thibet is the produce of mines or diggings. See Route No. 2, from Digarchi annexed. (p. 334.) The Yaroo itself does not yield any gold-washings. There are no mines of iron, silver, copper, quicksilver or lead in Thibet. All these metals, and their oxides are imported from China.

8th. The yellow Arsenic of commerce is found at Teloongchurfoo, near the borders of China to the North and West of Lassa ; it is called Pabea.

9th. *Peu-she*, Amber. The Thibetans always wear large opaque amber-like beads in their necklaces ; but the substance is not a produce of their own country, nor is it amber ; it is, I believe, expissated turpentine—gundaferoza, mixed with some hardening material. Friction makes it smell of turpentine. It is brought from Siling and other marts of China.

10th. Turquoise, *Gya yen*, or China stone.

*Pe yeu*, Thibetan stone.

*Te yeu*, Cashmere stone.

This beautiful stone is greatly prized in Thibet, and every one wears it, real or imitation, in rings, necklaces, earings and amulet cases. The best are very rare, and although found in Thibet, I believe, no one can give an intelligible account of the localities. I do not believe that the turquoise is a natural product of Thibet, and the following story corroborates the opinion.

“A great merchant of Thibet named Chongpo who traded, ages ago, with India, and once crossed the seas beyond India, brought the finest real turquoise to his native country. From that time the stone has been known there, and like coined money, it continues to circulate in the country as a medium of exchange.” The imitations brought from China are made of common earthen-coloured or other compositions. They are easily detected. Those imported via Cashmere are real stones but not valuable. The only test of a real stone is to make a fowl swallow it ; if real it will pass through unchanged.

*Route to the Salt Mines in Thibet.*

Digarchi to Panchooling 3 marches. Direction at Digarchi N. W. across the Yaroo.

Amringjong, 4 marches. Direction, N. W.

To Nakchang, 8 ditto, N. W.

Sang-zang Lhoda, 6 ditto, N. W.

Sakojong, 7 ditto, N. W.

To-then, 8 ditto, N. W.

Bomet, 3 ditto, N.

Lon-kurqun, 10 ditto, N.

Tarokchan, 2 ditto, N.

Borgpagege, 3 ditto, N.

To Salt mines, 1 ditto, N.

Being 55 marches for loaded men, each 10 miles, say.

*Route to the Gold diggings.*

The same from Digarchi as to the Salt mines as far as Sang-zang Lhoda, thence to Kasha 10 marches, N. by W.

To Komunk 5 ditto, N.

Two more marches to Gold diggings, N.

These marches are somewhat longer than the former ones, and may be each 12 to 15 miles.

*Animals.*

*The Goa*—An antelope.

*Gnow*—The ovis ammon.

*Rigong*—Hare.

*Kiang*—Wild ass.

*Lawa*—Musk deer.

*Shao*—A large deer, *Cervus affinis* vel. Wallichii.

*Cheu* or *Chiru*—Antelope Hodgsoni.

*Dong*—The wild yak of Thibet. The fiercest of all known ruminants. It will rarely allow a man to escape alive if it can come up with him. It is generally hunted on horseback, the great aim being to detach one from the herd. It affects open grassy places and goes in large herds. The following is the plan adopted by hunters on foot for killing the "Dong."

Its favourite pasturages are ascertained, and in the midst of these the hunters throw up circular enclosures of stone a few yards apart,

the hunter taking up a position in one of them. When a "Dong" is within shot, the hunter having fired at him, instantly quits his enclosure for another; for as soon as the animal hears the shot whether he is hit or not, he, guided by the smoke of the discharge, rushes furiously on the enclosure, and commences knocking it to pieces. When the hunter gets another shot at him he retires again from his shelter to a fresh enclosure, and so on, till he has killed his beast. The ordinary size of the "Dong" is four times that of the domestic yak, it is black all over, having occasionally a white streak in the forehead. The horns of a full grown Bull are said to be three feet long, and the circumference must be immense. The common mode of describing it is to throw out the elbow, bring the fingers to the ribs and point to the circle thus formed as the size of the base. It is used by the grandees of Thibet at marriages and other feasts, when it is filled with strong drink, and handed round to the company. Nothing more commendatory of the host's joviality can be said, than that "he regaled his guest out of the Dong's horn."

The horns so used are finely polished, and mounted with silver, or gold, and precious stones. If I ever succeed in getting one, I shall certainly present it for a "snuff mull" to the Highland Society, as the days of drinking in horns are over with us now.

It is common in Thibetan goompas—(Lamaserais,) to see a stuffed "Dong" standing in front of the image of Mahá Káli at whose shrine the animal is thus figuratively sacrificed; axes and other instruments of sacrifice are ranged around the image. Strange that Buddhists should preserve *this* feature of Hinduism in their places of worship, not more so however than, as Huc describes that a Lama should nearly go into fits on seeing a louse from his tunic impaled for the microscope, while the whole of his countrymen and co-religionists are among the greatest slaughterers and consumers of butcher's meat in the world.

*Pegoo*—the yak.

*Cow*—small, like the cow of Bengal. Hair long.

*Sauh*—cross between cow and yak.

*Sauh Yak*—produce of cow by yak bull.

*Ba Sauh*—produce of female yak by bull. These are great milkers, better than yak or cow; tail half-cow, half-yak. Females give

young with bulls or yaks, best produce with yaks. Elevation of shoulder less than in the yak. Hair long but less so than the yaks.

*Look*—sheep, four principal varieties; 1st, Chaug Look, or Northern sheep, very large with fine wool. Flocks of 400 to 1000 tended by one man;—2nd, Sok Look, rare, but greatly prized; it is a doomba or heavy-tailed sheep, comes from the province of Sok situated to the east of Lassa; wool not very fine;—3rd, Lho Look, a very small sheep indeed, generally white, sometimes black, is bred principally about Lassa; wool very fine and like the shawl wool;—4th, Changumpo Look; abundant about Geroo and in Dingcham, generally very large. I never saw finer sheep in my life than all these were; white wool very fine and soft. The flesh of all the Thibet sheep is fine-grained and good.

*Peu Ra*—Thibet goat, small, hairy, of all colours. Has an under coat of fine wool, similar to the shawl wool, but there is no shawl wool trade from Eastern Thibet to India at present. Flesh pretty good.

*Phák*—pig, two varieties. The Lho Phák or southern pig which is most abundant to the south of Lassa, and is described as similar to the Indian village pig, and the small China pig now abundant in Lassa and other towns: no wild hogs anywhere in Thibet. The Chinese butchers in Lassa blow their pork and take in the country folks greatly by its fine appearance.

*Cha*—common fowl, generally small in Thibet, and there is no large kind as in Sikim where the fowls are remarkably large.

*Damjha*—ducks. Not eaten by the Thibetans, but greatly prized by the Chinese, for whose use only they are bred near and in Lassa.

*Damjha Cheemoo*—goose. Not eaten by the Thibetans, but much liked by the Chinese.

*Gang Sir, Gung Kur, Chaloong, Toong Toong*—Comprise the numerous wild fowl, swimmers and waders, which migrate from India in March and April, and return in October and November; they are all eaten, but not extensively. There is a sort of prejudice against killing them; but as they all breed on the lakes and rivers of the country and are most numerous, the eggs are found in great quantities, the people who live by gathering and selling these eggs never



rob a nest of *all* its contents, but take about half the eggs. This forbearance arises from the general aversion to taking life which prevails in Thibet, and it has its reward as it is supposed that the birds if entirely deprived of their young, would not again return.

*Chungoo*—a wild dog, reddish colour.

*Koong*—the Civet, is brought from China and inhabits the Chinese borders of Thibet. It is mottled rather than striped.

*Sik*—leopard. Thibet or contiguous countries.

*Tagh*—tiger, ditto ditto.

*Somb*—bear. A red and a black species.

*Nehornehu*—a large sheep, or goat, or antelope. I do not know which, is found in the very rugged mountains north of the Yaroo river, and in the neighbourhood of the salt mines or lakes. Is four feet high, has very large horns, sloping back, and four feet long, has a tail 15 inches long, is shaggy, and of various colours, sometimes black and red.

No leeches, mosquitoes or peepsas in Thibet; and maggots or flies are never seen there. There are no bees or wasps in Dingcham or Thibet proper. In the valley of Choombi, a good deal of fine honey is found, which is exported to Thibet.

The lakes in Thibet are full of fish, one kind only is described, it grows to the weight of 8 lbs.; it is named “choolap,” it is not well flavoured or delicate. I have sent specimens of it to the Asiatic Society of Calcutta, and by Dr. Hooker to Sir J. Richardson. Enormous quantities are taken by the hand in the winter season; when the lakes are frozen over, a hole is made in the ice to which the fish immediately rush, and are then pulled out by the hand. Salt is not used to preserve fish, they are gutted, split up, the tail put in the mouth and allowed to dry in the open air, they keep in this way for a year. The principal lakes on this side the Yaroo are Yamdo Yeumtso, Ramchoo, Kala, and Chomotetoong near Dobta.

#### *Sheep grazing, &c.*

The number of sheep in Thibet is extraordinary. The flocks are immense, and a person of no consequence whatever will have 2,000 or 3,000 sheep. The large owners have as many as 7,000. The fleece is taken once a year in May or June. The ewes breed twice a year. The great lambing season is in April and May. The other

in October and November, many of the autumn lambs die from the cold, but this is not considered any great loss as the skins are so valuable. A cloak of lamb skins made of fourteen skins is worth 25 Thibet rupees or 10 East India Company's Rupees.

The rams remain with the ewes always, but after the ewes are in young, the rams have a sort of breeching put on. My informant's notion is, that this is done to prevent annoyance to the pregnant ewes, but I suspect that they are kept in this way, until the proper season for letting them to the ewes. The allowance of rams is two or three for every hundred ewes. The males are gelded when quite young or up to a year old, the prices vary from 5 to 7 Thibet Rupees per head, i. e. 2 to 3 rupees of ours.

The Government dues on sheep farms is 10 per cent. in kind every three years, this is in addition to a general tax of 1 rupee per door on all houses per annum.

During the summer season, but little fresh meat is used. The Thibetans do not like it boiled, and are not partial to it raw unless it has been dried. In November there is a great slaughtering in the towns, and a wealthy man in the country will kill two hundred sheep at this time for his year's consumption, the animal is butchered, skinned and gutted, and then placed standing on its feet in a free current of air. It becomes in a couple of days quite hard, and white, and is then ready to eat. It is kept in this way for more than a year, and undergoes great vicissitudes of climate without spoiling. I have seen it at Darjeeling in the rains quite dry and hard, and in no way decomposed. When long exposed to the wind of Thibet it becomes so dry, that it may be rubbed into powder between the hands. In this state it is mixed with water and drank, and used in various other ways. The Thibetans eat animal food in endless forms, and a large portion of the people eat nothing else.

The livers of the sheep and other animals are similarly dried or frozen and are much prized. To a person unused to the dried meat of Thibet, the liver is represented as peculiarly distasteful; it is bitter, and nearly as hard as a stone.

The fat is simply dried, packed in the stomachs, and thus sent to market or kept for home use.

The skins furnish clothing for the working classes and servants. All classes in Thibet put on furs of some kind at the commencement of the winter. It is not reckoned reputable to kill your own meat, and therefore every hamlet has its professional butcher. In towns it is a great trade from the enormous quantity of meat consumed. Some butchers will have five hundred carcasses dried and ready at their stalls. The trade of a butcher—Shempa—is hereditary and strange to say a despised one.

The horns of animals are not turned to any useful purpose in Thibet. Small houses are built in the suburbs of Lassa with horns and clay mortar. Goats are also reared in considerable flocks, but principally on account of their milk. The flesh of the sheep is infinitely preferred. The milk of yaks, cows, sheep and goats is used alike for making dried curds, and the various preparations of milk used by these people. The milk of mares does not appear to be used at all in Eastern Thibet, although ponies are extensively bred there. The number of other cattle renders it unnecessary. Fowls are of a small breed, and are reared with some difficulty. The large fowls of Sikim and Bootan are much prized there. The Thibetans do not care about fowl as an article of diet, and it is only since the period of the Chinese supremacy that fowls, pigs, or fish have been used by them. Even now in the places remote from Chinese posts pork and fowls are not to be had.—The Chinese must have pork, eggs, and fowls, and around Lassa, Giangtchi, Digarchi and other places and their stations, these are reared for Chinese consumption.

#### *Diseases.*

In July and August severe fevers are not uncommon. Cholera is not known; dysentery is, and is often violent, sometimes proving fatal in four days. Cough and diseases of the chest are prevalent.

Ophthalmia is very prevalent and very severe. Itinerant ocalists go about the country and are in good repute: they never perform operations, but cure by application of unguents and washes. Three days travelling in the snow without hair-blinds is sure to produce ophthalmia.

Skin diseases are by no means common, although the people are so filthy in their habits. The most dreaded and the most fatal of

all diseases is the small-pox. The people fly the infection, leaving their homes in the most inclement weather. Inoculation is regularly performed annually in the warmer seasons. Two methods are in use, one by incisions on the wrist, the other is effected by inhalation. A plug of cotton which has been impregnated with small-pox virus and dried is introduced into the nose and left there for two or three days, at the end of which the symptoms of the small-pox appear. This method was introduced from China where it is largely practised. Dropsy is rather a common disease, and is generally fatal in the cold season. There is very little Rheumatism in Thibet proper; at Bakchan in Choombi it prevails to a very great extent. There is a malady called the "Laughing disease" which is much dreaded, people die of it. It consists of violent fits of laughing with excruciating pain in the fauces and throat, men and women have it alike and is named "Joomtook" in the language of the country. It frequently proves fatal in a few days, but is not accompanied with fever.

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*Report on two specimens of Cuttack Coal from the Talcheer Mines forwarded by E. A. SAMUELLS, Esq., Commissioner of Cuttack. By H. PIDDINGTON, Esq. Curator Museum Economic Geology.*

Upon examining the specimens of coal, I find that they are wholly shale, and what is called Top coal, that is coal from the upper and generally inferior beds of a mine.

The shale it is useless to describe, being worthless.

The coal (Top Coal) varies much, some of it being composed of layers in which there are about equal parts of layers of shale of a dull black and of good bright bituminous coal. In other bits, the bituminous coal greatly predominates, and gives good promise that at a moderate depth, a really good coal might be met with. We can say nothing as to what the quantity might be.

The bituminous coal is a bright black glance coal, easily separating into flat sharp rhomboidal fragments in the layers, which in the forceps do not melt or flame, but shoot into singular ramifications which glow for a considerable time: the smell is that of good bituminous coal. It will not coke at all.

An average specimen of such of the coal as was not absolutely shale, and which I take to be Mr. Samuells' Moalpal coal\* gives

|                        |        |
|------------------------|--------|
| Water, .....           | 14.37  |
| Gaseous matter, .....  | 17.75  |
| Carbon, .....          | 35.62  |
| Ash (dark grey,) ..... | 32.25  |
|                        | <hr/>  |
|                        | 99.99. |
|                        | <hr/>  |

But the picked specimens of the bituminous coal, which I take to be his Gopalpersad sort? gave a far better result; or rather a very good one which was

|                            |        |
|----------------------------|--------|
| Sp. Gravity, .....         | 1.42   |
|                            | <hr/>  |
| Water, .....               | 3.25   |
| Gaseous, .....             | 36.90  |
| Carbon, .....              | 51.75  |
| Ash (fawn coloured,) ..... | 8.00.  |
|                            | <hr/>  |
|                            | 99.90. |
|                            | <hr/>  |

This kind of coal then, if a vein or bed of it can be found, is about equal to the good Ranneegunge, but at present the *average* of the coal would not be worth sending to Calcutta for a trial on a large scale as Mr. Samuells enquires; and all that should be done is, to sink a shaft for a good vein. Nothing but the existence of coal and the *promise* of good coal can be predicated from surface diggings on the out-crops of the upper beds only; and in sinking such a shaft, a merely good vein as to quantity and quality should not satisfy the miner, but the shaft should be carried as deep as possible to be certain that the best coal does not lie below; for the best coal is in the end always, the most economical to work.

\* The specimens have unfortunately no labels with them, though in two separate packages.



*Literary and Miscellaneous Intelligence.*

Professor Eastwick has addressed us the following letter on the subject of the criticisms by the Westminster Review of the new Edition of his translation of Bopp's Grammar. He certainly could not have adduced stronger testimony than he has in favour of his character as a translator.

*Haileybury College, March 15th, 1855.*

SIR,—I observe, in a late Number, you have noticed my new edition of Bopp's Comparative Grammar with the remarks made by the Westminster Review. Will you permit me to state that those remarks are *malicious* and *untrue*. In the first place only the 1st Volume of the 2nd Edition has appeared, whereas they wilfully mistake the old Edition of the 2nd and 3rd Vols. for a new Edition. Secondly, they wilfully insist on misprints as mistakes. E. g. in *one* instance J. Grimm's name which is quoted hundreds of times is misprinted F. Grimm, and they maliciously assert that it perpetually recurs in this erroneous manner of writing. They pretend that I have made Dümmler the Berlin Printer, the Author of some of Bopp's works, simply because in a few cases, where Bopp's refers to them in these words "*in meiner Abhandlung*" (Berlin, bei Dümmler) I have translated "in my treatise (Berlin, by Dümmler)" meaning, published by Dümmler, where there could be no possibility of a mistake.

It would occupy too much of your time, if I was to go through the eight or nine passages, which they have brought forward—*seriatim*, but I hope it will be sufficient to quote the words of *Professor Bopp himself*, of Professor H. H. Wilson and of Dr. Max. Müller, the three perhaps greatest philologists living. The first says, "I am perfectly satisfied with your translation, and have reason to thank you for its clearness." Prof. Wilson says, "the translation has been made with great scrupulousness and care, and it has required no ordinary pains to render in English, with perspicuity and fidelity, the not-unfrequently difficult and obscure style of the original." Dr. M. Müller says, "I have frequently compared your translation with the original, and I can conscientiously say, that few books have been so faithfully rendered into English from German

as this." If, then it appears to the Society, that I have been unjustly treated by the Review they have been pleased to quote,—I trust they will make me amends by publishing this letter in their journal.

I have the honor to be, Sir,

Your obedt. Servant,

EDWARD B. EASTWICH, *Professor E. I. College.*

In a letter received from Major Cunningham, shortly before his departure for England in April last, he announces the discovery of several new coins, "of which the most remarkable is," he says, "an Indian coin of Sapor. The name is written distinctly. The coin is a silver one, of the Kabulian type of Indo Sassanians. I presume that the coin must have belonged to Sapor the second, whose long reign was so successful against the Romans in the West."

He further mentions a Gold Kanerki with the reverse of OPAATNO and a bad duplicate of the hitherto unique tetradrachm of Diodotus.

Both Major C. and Mr. E. Thomas, on close examination of the fac-simile of the Thaneshwar inscription translated by Baboo Rajendralál Mitra, in a paper published at p. 673 of vol. XXII of our Journal, pronounce it to be "beyond all doubt a middle age one—that is," says Major C. "the forms of the letters are those of the 11th and 12th centuries. I read the date ११९० 1190 S. or 1133 A. D.' The Baboo professed only to read the inscription as it stood on the fac-simile before him: it must be admitted that the character in which it is written is a truer clue to the date than can be given by the best reading of the figures representing the date. But we shall shortly publish the fac-simile with a view to inviting further discussion of the true date of the inscription.

The Stacy collection of coins has been catalogued and valued by Mr. E. Thomas at Mussooree and has been offered to the British Museum.

It is gratifying to find that the N. W. Government has favourably entertained a project, by Mr. Thomas, for publishing in a series the texts of all Persian Historical works on Hindustan.

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,

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FOR APRIL, 1855.

The Society met on the 4th instant, at half-past 8 P. M.

SIR JAMES W. COLVILLE, Knight, President, in the chair.

The proceedings of the last month were read and confirmed.

Presentations were received—

1. From J. Hodges, Esq. a spear and throwing stick from Swan River Settlement, Western Australia.

2. From Colonel Baker, 21 Indo-Bactrian copper coins.

The following gentlemen, duly proposed and seconded at the last meeting, were balloted for and elected ordinary members.

W. G. Young, Esq. C. S.

Babu Kalichurn Roy.

Captain C. B. Young, Beng. Eng.

His highness Muhammed Hossain Ali, Ex-Amir of Scinde was named for ballot at the next meeting, proposed by Sir James Colville, and seconded by Mr. Grote.

Read a letter from Dr. Clarke expressing his wish to withdraw from the Society.

Mr. Houstoun gave notice of his intention to make the following motions and enquiries at the next meeting, viz.

1. To have laid before the meeting all notes or comments relating to the introduction or cancelment of any introduction to No. 80 of the Bibliotheca Indica.

2. To request that Mr. H. V. Bayley, be requested to accept the Joint-Secretaryship of the Asiatic Society.

3. To know what communications are, as a matter of course, and in what stage, to be laid before the Society, and for what communications the Society must depend upon the Council.

4. To know by whose advice and authority the niche has been made in the Society's meeting room, to the obstruction of a proper circulation of air.

Communications were received—

1. From the Government of India, enclosing extract from a despatch by the Hon'ble the Court of Directors, together with observations by Dr. Royle, on the Graphite or Plumbago of Kumaon and Travancore.

2. From Dr. J. Fayrer, Lucknow, Meteorological Registers kept at the Lucknow Residency for the month of August to December, 1854.

3. From Bábu Rádhánáth Síkdár, abstracts of the results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November, 1854.

4. From Rájá Rádhákánth Deb, communicating his thanks to the Society for having been elected an Honorary member.

5. From Dr. Campbell, a note on the Limboo alphabet, by Captain Mainwaring.

6. From Lieut. F. Burton, in command of the Somali expedition, announcing despatch of some specimens collected by Lieut. Speke, 46 B. N. I., and enclosing a descriptive list of the fauna of the Somali country.

The following is an extract from Lieut. Burton's letter which is addressed to Mr. Blyth, the Curator of the Zoological Department of the Museum.

"On the 18th October, 1854, Lieut. Speke, by my direction, landed at 'Goree Bunder' (as our maps call it) in the country of the Warsangeli, a large sub-family of the Somali nation. After much trouble and detention on the coast—carriage being with great difficulty purchasable in that part of Eastern Africa—Lieut. Speke started inland towards the Wady Nogal.

"The country traversed by Lieut. Speke along the coast was a tract of sand and limestone, thinly overgrown with jungle. Water was scarce, only one well of pure water being found. Animals did not abound, a few hyænas, and jackals, gazelles, the gúrnuK (gunnouk) antelope, and a little land antelope were discovered. Besides gulls, there were very few birds.

"The distance across the plain from the sea to the mountains, varies from half a mile to two miles. On the 18th November, Lieut. Speke ascended the hills by the bed of a mountain-stream, the only 'Pass' known

in these wild countries, and on the 21st he reached an encamping ground called Adda near the top of the mountain. Here his thermometer (which at the level of the sea boiled at  $214^{\circ}$ ) boiled at  $204^{\circ} 15'$ , shewing an altitude of about 5,500 feet. The highest point reached is denoted by  $200^{\circ} 15'$ . These mountains are covered with a thin scrub of acacia in the lower folds. The upper summits are thickly clad with jungle, amongst which grow trees, and a kind of pine called by the Arabs سنوبر (sinanbar), and by the Somalies ديب (dazzib) were conspicuous: Lieut. Speke recognized this tree as familiar to him during his Himalayan wanderings. This vegetation however is confined to the northern or seaward face of the mountains: the southern slopes are bleak and bare. The beasts are rhinoceros (single-horned), a large deer called 'godi,' gazelles, the 'alakud' antelope, a few leopards, which the Somalies fear greatly, and hyænas (none of which were seen). The birds were chiefly hill rock-pigeon and a description of brown partridge. These hills are covered with fossil shells, denoting a lime-stone formation.

"On the 4th December, Lieut. Speke began to descend the southern slope of the mountains which fall about 2,500 feet, the thermometer boiling at  $205^{\circ} 30'$ . This is the undulating plateau 'above the ghats' which forms the country of the Somalies, Lieut. Speke believes the slope to be from north-west to south-east, and doubts any depression towards the Wady Nogal or due south. The southern side of the mountain drops in steps or terraces, and was then almost devoid of verdure. Water was scarce and brackish: a few superficial springs are scattered about the country, and the depth of the wells or rather the holes in which water is found, is sometimes as great as 60 feet.

"Arrived at 'Rhat,' the most favoured spot in the Warsangeli country, Lieut. Speke found the Kraals of the Nomades numerous, and some interesting ruins said by the people to be of Christian origin. Thence the traveller turned westward and being prevented by the unsettled state of the country and the drought, which at this season is always a formidable obstacle in the eastern parts of Africa, he returned to 'Goree Bunder' and thence embarked for Aden.

"The collection of specimens made by Lieut. Speke embraces the different varieties common to the maritime plain, the ghats, and the plateau above the mountains. A few sparse notes and notices of the habits and habitat of the animals, together with their Somali names, may perhaps be interesting and assist so distinguished a naturalist as yourself in preparing an account of them for publication. May I be allowed to mention that Lieut. Speke has been himself most zealous in collecting and preparing skins, even under the most adverse circumstances, and that during



our future wanderings we shall have (it is expected) greater opportunities of labour in the field of investigation."

7th. From Mr. Secretary Beadon, forwarding a Report (by Mr. Marcadieu) on the ferruginous resources of Kooloo, together with some specimens.

8th. From H. Piddington, Esq. submitting the following papers.

1. A Report on the Cherrapunji Coal.
2. A ditto on the Coal from Talcheer in Cuttack.
3. A ditto on the Kunkurs and Iron stones of Burdwan.

9th. From Dr. Sprenger suggestions and observations for the improvement of the Bibliotheca Indica.

The Curators of the Museum and the Librarian submitted their reports of additions made to their Departments during the month of March last.

*Report of the Curator, Museum of Economic Geology, March, 1855.*

GEOLOGY AND MINERALOGY.—We have received from Dr. Campbell, Resident of Darjeeling, a series of 34 specimens of rocks collected by that gentleman near the Cholamoo lake in Thibet, on his mission to that country in October, 1849.

It will be recollected that Captain Sherwill in sending us a specimen of the meteorite which fell at Segowlee, mentioned in my last Report, said that he had obtained it from Mr. Glover of the C. S. who had a larger fragment. Learning from him that that gentleman was in Calcutta, I called upon him and he was good enough to promise me another piece for the Society. This fine specimen is now on the table and on comparison with the Allahabad meteorite, it will be seen that they much resemble each other as to their earthy matrix. The Segowlee specimen however, containing numerous white grains (probably sulphuret of nickel) while the Allahabad stone contains evidently fragments of meteoric Iron imbedded.

ECONOMIC GEOLOGY.—I have put into the form of a paper for the Journal my examination of a specimen of Coal from Cherrapunji from a new mine opened by Mr. Inglis and forwarded to us by Messrs. Gilmore and McKilligan, which is not only a first rate gas Coal, but has disclosed some remarkable peculiarities in its coking, which for the present, are very unaccountable.

I have also put into another short paper my examinations of some of the Burdwan Kunkurs, with reference to their applicability as a flux in

the smelting of the iron ores of that district, as shewn by Mr. Taylor of Toposi Colliery in his specimen of iron smeltings.

Mr. Pontet has sent me a specimen of a supposed copper ore from the Railroad cuttings in the Damun-i-koh, but it is nothing more than a red and green Jasper with specks of arsenical pyrites (mispickel) which give in some places a bright metallic streak resembling silver.

Dr. Campbell has forwarded specimens from the further working of the Pushak copper ores already alluded to in my Reports and in the paper on them vol. xxiii. p. 477 of the Society's Journal requesting an opinion as to whether there was any improvement. The only one, which appears evident is that the matrix is somewhat softer.

From E. A. Samuells, Esq. C. S. Commissioner of Cuttack, I have received a letter which gives the following account of his visit to the Coal fields of Talcheer on the Brahminee river.

"I returned from the jungles yesterday and hope by to-day's dak-banghly to send you my first specimens of Coal, iron, iron-stone, &c. The number of the Journal containing Kittoe's researches has never reached me, and I do not know therefore whether I can communicate any thing to the Society with regard to the Talcheer and Ungool coal beds with which they are not already familiar; I may mention shortly to you the route which I took and which will enable you to judge. From Cuttack I proceeded through Dhemkond to Balpore on the Brahminee; there I was told that coal existed in the neighbourhood and sending off a party of workmen in advance, I started after breakfast for the locality, a village called Kangriapara about three miles from Balpore, but when we got near the place we were met by the ominous announcement that the coal was so hard it had turned the points of all the crowbars, and that no one could make any impression on it. On arriving at the spot, the mystery was explained. The supposed coal was a large mass of quartzose rock (No. 7 of the specimens) which thrust its surface blackened by the forest fires which annually swept over it to a height of 20 or 30 feet above the surrounding soil. It was so hard, that I broke my hammer in securing a specimen. At Kumlong about 25 miles further up the Brahminee, I found drift coal in the river opposite the mouth of a nullah called the Nunderajore and immediately below a singular barrier of rock called Jetea Ghatee which is here thrown across the bed of the river. There was no coal in the environs of this barrier or above it, so that I concluded the coal must have been brought down the Nundera, but I could not hear of any coal in that direction; cliffs of a clayey slate are common along the upper part of the stream which I afterwards crossed, but every one assur-

ed me that coal was unknown. I was particularly anxious to discover where this coal came from, because we tried it in camp and found it remarkably good; unfortunately relying upon procuring more next day, in which I failed, we burnt all that I had picked up. The coal bed I explored near the Talcheer Raja's, was the same which Messrs. Beetson and Kittoe had examined at different times. It is situated in the bed of the Bilyejore at the village of Moalpal about two miles above the Raja's residence, a coarse sand stone is the prevailing stone throughout the neighbourhood. The spot where Messrs. Beetson and Kittoe had dug, was pointed out to me, but I preferred breaking new ground and choosing a spot several hundred yards further up, I dug down from the top of the bank, some 12 or 14 feet high, upon the bed. We found first about a foot of peaty substance-like coal, but so soft that you could thrust a stick through it, then coal shale below, which was indifferent coal much mixed up with shale; about 8 or 10 inches below which was a hard slaty rock. The whole bed 5 or 6 feet in thickness, I left a man to bore through the slate and he came to a few inches of coal (specimen No. 10), and below that slate again. The coal is visible on the left hand bank of the nullah for about half a mile, and it might be worth while to sink a shaft at some little distance back from the nullah, when better coal than that obtainable so close to the water, might be procured. If coal exists here of good quality, it would pay well to work it, as there is water carriage down the Brahminee to Point Palmyras; and the Dhamrah river, if the outer channel is properly buoyed off, is accessible to steamers and vessels of 500 or 600 tons. Gopalpersad is from 16 to 20 miles inland from Talcheer, that is inland from the Brahminee river. It stands on a wide torrent, called the Sengra which never has much water, and is usually dry. For several miles above Gopalpersad and about a mile below it the right bank presents a succession of stratified coal cliffs, which have an exceedingly curious appearance; the jungle in rear of these cliffs in many places, presents the appearance of a coal-field such as one is accustomed to see in Durham or Northumberland the whole ground being covered for considerable distances with coal shale and dust. I saw Beetson and Kittoe's excavations, but dug further back and deeper than either of them. The appearance of the coal about six feet back from the river and two or three feet below its bed was excellent; hard, sparkling and much less laminated than the more exposed coal on the cliffs. I marked out a place in the jungle also about 100 yards from the river above the village, when I ordered a pit to be sunk, but going away myself to the village of Kunkerei to see the iron works there, the coolies, to save themselves trouble, commenced on one of

the cliffs close by, and it was not until I was on the eve of departure, that I discovered the mistake. I send you specimens of this coal, and will write you officially regarding it. It will depend on your report whether I send up any large quantity to Calcutta for trial or not. The iron, I send, is from Kunkerei, a village in Ungool, close to the very extensive coal field of Gopalpersad. I have had sketches made by a friend of their process, and also of the Gopalpersad coal cliffs, which I will send you by and bye, the process is most primitive, but the iron bears a high character, 18 seers of the impure iron as I send it you, are sold at the furnace for one rupee; when freed from impurities and well hammered it fetches in the Cuttack bazar, a rupee for 8 seers. The axes and chisels made of it in Cuttack are excellent, *no flux whatsoever is used*. The charcoal is made from the Sal (*Shorea robusta*) I brought a large package of it with me; but my idiot of a bearer choose to think it was of no use and threw it away or cooked his dinner with it. I send you a good deal of slag which I picked up about the forge, I have plenty more if you require it. I had no time to go to the gold regions in Paldeyra; as it is I start again on the 16th for Bood, and shall not be under cover I fancy before May."

The specimens and sketch alluded to, have also reached and are upon the table, and I have examined the coal of which also a detailed report is drawn up for the Journal: the iron ores I have not yet had time to examine.

From Lieut. W. D. Short, Executive Engineer, Midnapore, I received a minute portion of gold dust and gold sands with a request that I would examine them. The following is an extract of my letter to him from which it will be seen that there exists in the gold sands of that district something which would resemble a new mineral, but with such excessively minute specimens nothing very positive can be announced.

"First your gold *dust* contained minute bits of copper, no doubt adulterations? unless you saw them washed out before you in which case they must be native copper?"

"Then, in the gold dust and in the washed sand, I found some very minute (pin's head) particles of a mineral which was yellow-white, malleable, and tough; would not amalgamate with mercury! and was excessively difficult of solution in boiling Aqua regia!! though it certainly contained gold!!! What else I was unable to determine, but am inclined to think it may be a sulphuret of gold, a mineral not yet found to exist though gold is found in iron pyrites (sulphuret of iron) where it is therefore *supposed* to exist as a sulphuret.

"All this upon minute pin's-head bits (three of them I think) in watch-glasses, and results watched by a magnifier; so we can say nothing more



positive than as above. I could only trace in the whole of the solutions a doubtful trace of platinum; none of palladium or rhodium.

“But I have now to request that you will, if possible, obtain for me, say at least a quarter of an oz. of the gold dust *from the same locality*, and a quarter of a lb. of the washed sand, the cost of which I shall be glad to pay as you may direct, if you cannot put it into a contingent bill; but if possible I should be glad that it should be washed out before a confidential person, should you not be able to attend to it yourself. Mr. Samuells informs me that the gold-washers thereabouts do not use mercury as they do in the N. W. Provinces. I despatch however to you, per dawka, a pamphlet on the method of saving the greater part of the mercury, but if this new compound exists in any quantity that may be the reason why they do not use mercury. The Burmese are said to throw away the platinum, calling it Devil’s metal, i. e. because they can do nothing with it. Do your washers know any thing of any *Shaitan Ka gotce* in their products?”

From Dr. Campbell of Darjeeling we have received two specimens of Copper Ore, being one from his farther diggings at Pushak, an ore already examined as above and another from a new locality called Mahaldiram.

My reply to his letters, is as follows:

A. CAMPBELL, Esq. *Darjeeling*.

SIR,—I have, as you requested, examined the specimens from the farther workings of the Pushak Copper Vein, and I think (differing herein from you,) that there is an evident improvement though not in the ore, yet in the matrix which seems much softer, and I have moreover picked from amongst the specimens two or three small fragments approaching to the pavonine or peacock ore of the Cornish miners which is much richer in copper than the common pyrites. If you reach a vein or bed of this, you may probably find something well worth your search.

The Mahaldiram specimens are, as to abundance, a much more promising ore; though as with the former Pushak, its matrix is tough and in some parts siliceous, but there are good sized lumps of massive ore which make it altogether a far better vein to work at present, than the Pushak, supposing both to be of pyrites only.

I must not, however, forbear to repeat to you that surface indications are next to worthless, till a shaft of some depth has been sunk. I should sink as deep, or drive a gallery as far, as the workmen will go; for these poor ores often overlies much richer deposits of copper; and in America even of silver!

H. PIDDINGTON,

*Museum, 19th Jan., 1855.*

*Cur. Mus. Eco. Geology.*



From a friend in China Lt. Conover U. S. Store ship *Supply*, I have received a specimen of Coal from Japan, and one from Killow in Formosa, both of which are good looking Coal. We had no Coal from the Eastward farther than from China hitherto in the Museum, so that these specimens are great prizes.

We have received an imperfect crystal of native sulphur from Persia, presented by Mr. J. B. Lawson.

We have also received from Mr. Pontet, a fine specimen of Umber. The locality is not stated in that gentleman's letter, which he dates only from the "Jungles," but which I suppose to be situated in the Damun-i-Koh. He says it is embedded in the hill side at about 1000 feet elevation, and that there is evidently a very large vein (bed) of it; what is exposed may be five feet thick.

*Report of Curator, Zoological Department, for April Meeting, 1855.*

I have now the pleasure to acknowledge and report upon a fine collection of skins received from Dr. E. Rüppell of Frankfurt: a collection which has afforded the long sought opportunity of actually comparing sundry Indian and E. African birds together; and the results of such comparison I proceed to lay before the Society, while I distinguish the numerous species which are new to its museum by prefixing an asterisk to each name.

MAMMALIA.

\**CERCOPITHECUS ENGTHITHIA*, (Herm., apud Gray; *C. griseo-viridis*, Desm.; &c.) Abyssinia.

\**CANIS VARIEGATUS*, Rüppell. Abyssinia. (Skull wanting.)

\**VULPES VIRGINIANUS*, (Gmelin: *V. cinereo-argenteus*, Richardson). N. America.

\**SCIURUS MULTICOLOR*, Rüppell (*Sc. cepate*, A. Smith). Abyssinia. (Skull wanting.)

\**XERUS SETOSUS*, (Forster; *Macroxus leuco-umbrinus*, Rüppell; &c). Abyssinia.

\**PSAMMOMYS OBESUS*, Rüppell. Egypt.

\**FIBER ZIBETHICUS*, (L.) N. America.

\**POTAMOCHÆRUS AFRICANUS*, (Schreber; *Sus chæropotamus*, Desmoulin; *S. larvatus*, F. Cuvier). Skin, without skull. From S. Africa.

\**COASSUS NEMORIVAGUS*, (F. Cuv.; *Cervus simplicicornis*, Illiger). Doe, from S. America. (Skull wanting.)

AVES.

\**PEOCEPHALUS MEYERI*, (Rüppell). Abyssinia.

\**AGAPORNIS TABANTA*, (Stanley). Abyssinia.

\*CIRCUS RANIVORUS, (Daud.) Africa. Two specimens.

\*SPIZÆTUS OCCIPITALIS, (Daud.) Abyssinia.

\*AQUILA NÆVIODES, (Cuv.; *Falco senegalus*, Cuv.; *F. rapax*, Temminck; *F. albicans*, Rüppell; *Aq. choka*, A. Smith). Abyssinia. This African bird is considered by Mr. G. R. Gray to be identical with the Indian *AQ. FULVESCENS*, Gray (v. *Aq. fusca* et *Aq. punctata*, Gray, et *Aq. vindhiana*, Franklin). The specimen sent by Dr. Rüppell has much larger and more powerful legs and talons, and is altogether a stouter and stronger bird, than its Indian near affine; for which reason we consider it to be a distinct species.\*

\*HALIAËTUS LEUCOCEPHALUS, (L.), in immature plumage. N. America.

MILVUS ÆGYPTIUS, (Gm.: *Falco Forskalii*, Gmelin; *F. parasitus*, Daud.; *F. parasiticus*, Latham). Egypt. Identical with a specimen from S. Africa, presented by Capt. Sherwill; and readily distinguished from the other dark-coloured Kites by its yellow beak.

\*POLYBORUS BRASILIENSIS, (Gmelin). Chili.

\*GYPΣ RUPPELLI, C. L. Bonaparte. (*G. Kolbei* apud Rüppell). Fine adult, from Abyssinia. Upon a former occasion (*J. A. S.* XIX, 502), we called attention to the great difference of opinion among the best ornithologists regarding the specific unity or distinctness of various races of Vulture, which have been comprehended under *G. FULVUS*, (L.) About the same time, the Prince of Canino published his matured opinion on the subject, in the *Rev. Zool. &c.*, 1850, p. 447; and we feel satisfied of the correctness of his views. His highness recognises,—1, *G. FULVUS*, (L.), of Europe (and we may add the high mountains of Asia, as the Himalaya).†—2, *G. OCCIDENTALIS*, Schlegel (v. *Kolbei* apud Temminck, *Man. d' Orn.* IV, 587), of the Pyrenees, Sardinia, and the Barbary States.—3, *G. RUPPELLI*, Schlegel (*vulgaris?* C. L. Bonap., *ibid.* p. 242, v. *Kolbei* apud Rüppell), of E. Africa.—4, *G. KOLBEI*, (Daudin), founded on the S. African *Chasse-fiente* of Levaillant.—5, *G. INDICUS*, (Scopoli, v. *tenuiceps* and *tenuirostris*, Hodgson), of India and the Malay countries. And 6, *G. BENGALENSIS*, Gmelin, of India (and also E. Africa, according to Rüppell). Our museum now possesses the whole of these, with the exception of *G. KOLBEI* of S. Africa: and there can be no doubt of the distinctness of the others. With the exception of *G. BENGALENSIS*, all are very remarkable for possessing 14 rectrices.‡

\* We also exceedingly doubt the alleged identity of the Indian *BUTEO CANESCENS* with the Nubian *B. RUFINUS*.

† In Macedonia, this species was noticed by Capt. Drummond to be "most numerous in the plains as well as the mountains." *Ann. Mag. N. H.* XVIII, 10.

‡ In *G. FULVUS (verus)*, which is the 'great White Vulture' of the Himalaya,

\*NEOPIRON PILEATUS, (Burchell; *N. carunculatus*, A. Smith; *Pernopterus niger*, Lesson; *Cathartes monachus*, Temminck). Abyssinia.

\*CATHARTES AURA, (L.) Chili.

BUBO VIRGINIANUS, (L.) N. America.

\*PROMEROPS CYANOMELAS, Cuvier. Abyssinia.

HALCYON SENEGALENSIS, (L.) Nubia.

\*MEROPS CERULEOCEPHALUS, Latham. Abyssinia.

\*M. LAMARCKI, Cuvier (*M. viridis* apud Rüppell). Two specimens, from Abyssinia. This differs from the Indian *M. VIRIDIS*, L., in having much more ferruginous on the wings, extending across both webs of the primaries and secondaries; and the throat is yellowish-green, tinged with ferruginous, having scarcely a trace of verditer except on its extreme

the clothing plumes generally are elongated and lanceolate at all ages; and those covering the craw are pale or whitish. It is also a larger bird than the others; the closed wing of a young Nepalese specimen measuring 33 inches.

In a fine adult of *G. OCCIDENTALIS*, from Algeria, the closed wing measures but 27 inches. The clothing feathers are much less acuminate than in *G. FULVUS*, and resemble those of *G. RUPPELLI* in form; but their colour is throughout dull pale isabelline, slightly tinged with ashy excepting round the margins; and the hue of those covering the craw is much darker.

In the adult *G. RUPPELLI*, the whole plumage is fuscous, with strongly contrasting whitish margins more or less broad, imparting a handsome variegated appearance, especially to the scapularies and coverts of the wings and tail: feathers covering the craw blackish; and those forming the white ruff shorter and more dense than in either of the preceding. Length of wing 24 inches.

As we have all ages of the affined *G. INDICUS* for reference, we observe that its feathers are not more or less acuminate according to age; and in the young of this species and of *G. FULVUS* (and doubtless of the others also), the feathers of the upper-parts have a medial pale streak, but not the broad whitish margins which distinguish the adults of *G. RUPPELLI*.

In *G. RUPPELLI*, the beak is somewhat broader in proportion to its length than in *G. FULVUS* and *G. OCCIDENTALIS*, resembling that of *G. BENGALENSIS* except in having its ceral portion more prolonged backwards; while *G. INDICUS* has a comparatively slender bill, especially as viewed laterally, with its ceral portion remarkably elongated. In a particularly fine adult of *G. INDICUS*, the closed wing measures  $24\frac{1}{2}$  in.

Good Himálayan specimens (skins) of the adult and young of *G. FULVUS*, with skeleton; and skeleton also of *VULTUR MONACHUS*, the 'Great Black Vulture' of the Himálaya; and of the *GYPÆTOS*, popularly mis-called 'Golden Eagle' by English residents;—would be very thankfully received for the Society's museum.

lateral margin bordering the black eye-streak, and very little of it even there.

DENDROBATES GOËRTAN, (Gm. ; *D. poiocephalus*, Swainson). Two specimens, from Nubia.

\*CAMPETHERA NUBICA, (Boddäert); *Picus punctatus*, Cuv. ; *P. notatus*, Lichtenstein. S. Africa.

\*C. ETHIOPICA, (Hemprich). Two specimens, from Abyssinia.

\*LEMODON BRUCEI, Rüppell. Abyssinia.

\*L. UNDATUS, Rüppell. Abyssinia.

\*L. MELANOCEPHALUS, Rüppell. Abyssinia.

\*BARBATULA CHRYSOCOMA, (Temminck). Abyssinia.

\*TRACHYPHONUS MARGARITATUS, Rüppell. Abyssinia.

\*TURACUS LEUCOTIS, Rüppell. Abyssinia.

COLIUS SENEGALENSIS, L. Abyssinia.

\*C. LEUCOTIS, Rüppell. Two specimens, from Abyssinia.

\*OXYLOPHUS AFER, (Leach, = *Levaillantii*, Swainson, and *ater* apud Rüppell; nec *ater*, Gmelin, which = *SERRATUS*, Sparrman, a common Cape species, which the late H. E. Strickland received from Kordofan).\* Specimen from Abyssinia. Throat and fore-neck black, the feathers laterally edged with dull white, which gradually increases downward; the black predominating much more than as represented in Swainson's figure (*Zool. Ill.* 2nd series, Vol. I, pl. 13), and spreading downward over the breast and flanks.

\*CENTROPUS SUPERCILIOSUS, Rüppell. Abyssinia.

\*CAPRIMULGUS ISABELLINUS, Temminck. Ditto.

\*CORVULUS CRASSIROSTRIS, Rüppell. Ditto.

\*CORVUS PHŒOCEPHALUS, Cabanis. (*C. scapulatus* apud Rüppell.†) Ditto.

\*LAMPROTORNIS CYANIVENTRIS, nobis, n. s. : *L. nitens* apud Rüppell, from Abyssinia; nec *NITENS* (L.), of S. Africa, from which it differs in having a conspicuously shorter bill, and in various details of colouring. In *L. NITENS* (*verus*), the whole plumage is glossy *æneous* or steel-green, brightest on the wings, and mingled with steel-blue on the head and neck; the abdominal region being of the same hue as the back, but an admixture of steel-blue is observable on the tibial plumes, axillaries, and

\* Vide *P. Z. S.* Nov. 26, 1850.

† Vide the Prince of Canino, in the *Comptes Rendus*, tom. xxxvii (1853), p. 829. This Abyssinian specimen, however, accords precisely (even in measurements) with Swainson's description of *C. CURVIROSTRIS*,—? (*nec* Daudin, v. *leuconotus*, Sw.), of W. Africa, which is stated to be distinct from the nearly affined *C. SCAPULATUS*, Daudin, of the Cape; while another, of similar colouring, will stand as *C. MADAGASCARIENSIS*, C. L. Bonaparte.

under wing-coverts: shoulder of the wing (under the scapularies) bright steel-blue or purple, tipped with amethystine, which forms a distinct bar. In *L. CYANIVENTRIS* the upper-parts are glossy steel-green, uniform on the crown, nape, and back, but passing to bluish on the rump and upper tail-coverts, and also on the ear-coverts; throat and breast like the back, but the belly and thighs are brilliant steel-blue mixed with amethyst; as likewise the axillaries and under wing-coverts, which are very brilliant, the amethystine hue prevailing: shoulder of the wing (under the scapularies) steel-blue, with no terminal amethystine bar as in *L. NITENS*, but a little of this colour shewing at the bases of the feathers. In *L. CYANIVENTRIS*, the wings are more uniformly glossed than in *L. NITENS*, extending quite over the tertiaries and primaries; and the wing-coverts and tertiaries have their black terminal spots larger and rounder. In fact, the northern bird approaches in brilliancy to the superb *L. SPLENDENS*, (Leach, v. *L. ptilinorhynchus*, Swainson,) of W. Africa, of which also we possess a fine specimen.

\**JUIDA RUFIVENTRIS*, (Rüppell). Abyssinia. This form approximates the Malayan genus *CALORNIS*, G. R. Gray; but the feathers are throughout rounded or not acuminate,

\**HYPHANTORNIS AURIFRONS*, (Temminck). Male and female. S. Africa.

\**PLOCEUS* ———? Male. S. Africa.

\**PL. LARVATUS*, Rüppell. M. and F. Abyssinia.

\**EUPLECTES XANTHOMELAS*, Rüppell. M. and F. Ditto.

\**EU. FLAVESCENS*, (Daud.; *Fringilla phalerata*, Illiger). S. Africa.

\**EU. FLAMMICEPS*, Swainson. M. and F. Abyssinia.

\**COLIUSPASSER TORQUATUS*, Rüppell. (*Vidua rubritorques*? Swainson). M. and F. Abyssinia.

\**VIDUA PARADISEA*, (L.) Two females. Abyssinia.

\**V. SERENA*, (L.; *V. erythrorhyncha*, Swainson). Abyssinia.

\**AMADINA* (?) *FRONTALIS*, (Vieillot). Abyssinia.

\**MUNIA CANTANS*, (L.) Two specimens, from Abyssinia. Affined to the Indian *M. MALABARICA* (v. *Lonchura cheet*, Sykes).

\**ESTRELDIA ELEGANS*, (Vieillot; subg. *Pytilia*, Swainson). Abyssinia.

\**E. BENGALUS*, (L.) Abyssinia.

\**E. CINEREA*, (Vieillot). Abyssinia.

\**PASSER SIMPLEX*, (Lichtenstein; *P. Swainsonii*, Rüppell: nec *P. simplex* apud Swainson, which = *P. GULARIS*, Lesson). Abyssinia.

\**P. SALICICOLUS*, (Vieillot; *P. hispaniolensis*, Tem.) Female, from Egypt. This species was observed in Afghanistan by Capt. Thos. Hutton, and is not uncommon at Peshawur. In Kohát it abounds, and is there known as the 'Kábul Sparrow.' (Lt. Alex. J. Trotter, in *epistolá*.)



\**EMBERIZA SEPTEMSTRIATA*, Rüppell. Abyssinia.

\**SERINUS* (?) *STRIOLATUS* (*Pyrrhula striolata*, Rüppell). Female, from Abyssinia. This bird combines the beak of a *CARPODACUS*, with the plumage of a Serin, *CRITHAGRA*, or Siskin. The species of the true Canary-bird type, or *CRITHAGRA* of Swainson, Dr. Rüppell refers to *SERINUS*.\*

\**CRITHAGRA NIGRICEPS* (*Serinus nigriceps*, Rüppell). Two males. Abyssinia.

\**CR. XANTHOPYGIA* (*Serinus xanthopygius*, Rüppell). Abyssinia.

\* His *S. TRISTRIATUS*, however, we consider to be a *PASSER*; and may here add, that the *S. aurifrons*, nobis, *Catal.* No. 681, proves to be identical with *Passer pusillus*, Pallas, and will now stand as *SERINUS PUSILLUS*. We have not the European Serin (*S. MERIDIONALIS*, C. L. Bonap.), for comparison; but M. de Selys Longchamps informs us that the beak of *S. PUSILLUS* resembles that of *S. MERIDIONALIS* when viewed laterally, but is a little less bulged, as seen from above. The beak of *S. (?) STRIOLATUS* is probably even more bulged, as viewed from above, than that of *S. MERIDIONALIS*; but we suspect that *SERINUS* (as founded on the European bird, *Fringilla serinus*, L.), is the modern genus or sub-genus with which it best accords.

*S. PUSILLUS* has hitherto been only known to inhabit the high mountains of W. Asia; and according to Pallas is common upon the Caucasus and about the Caspian sea. In summer it is found near the snow-line, together with *MONTIFRINGILLA NIVALIS* and *RUTICILLA ERYTHROGASTRA*; descending in winter to the sub-alpine regions of Persia. *S. MERIDIONALIS* is "common in Asia Minor, visiting the plains in flocks during the winter." (Strickland).

Our specimens of *S. PUSILLUS* were procured by Capt. T. Hutton and by L. C. Stewart, Esq., in the vicinity of Masuri, in different winters; and Capt. Hutton lately informed us, that he had "fallen in with it this winter (1854-5), after an interval of many years. It appeared to be always in pairs, and like our Siskin and Goldfinch is very fond of alighting upon the tall coarse nettles which abound here. They are merely winter birds at Masuri, and seem to have left about the middle of February." In summer, we are informed by Lt. Speke, of the 46th B. N. I., that "it is found in Spiti and Ladakh at an altitude of from 10 to 13,000 ft., but not in such quantities as *PYRRHOSPIZA PUNICEA*; more than 2 or 3 being seldom seen at a time; and like the Goldfinch they are not confined to a distinct locality."

So far as we can remember, the genus *PYRRHULOIDES*, nobis, *J. A. S.* XIII, 951, founded on *PYRRHULA EPAULETTA*, Hodgson, *As. Res.* XIX, 156, is nearly affined to *SERINUS*, and intermediate to that genus and true *PYRRHULA*. (*S. PUSILLUS* is the type of the division *METAPONIA*, C. L. Bonap., *Comptes Rendus*, XXXVII (1853), p. 917).

CALANDRELLA BRACHYDACTYLA, (Tem.) Two specimens, from Abyssinia. Head less rufescent, and with the dusky mesial streaks to the feathers more developed, than we remember to have seen in Indian specimens: but an example from Algeria differs in no respect from the latter.\*

\*ALAUDA RUFICEPS, Rüppell. Two specimens, from Abyssinia.†

AGRODROMA SORDIDA (*Anthus sordidus*, Rüppell). Before receiving this Abyssinian specimen, we had provisionally identified the large dull sandy-coloured Pipit of the Panjáb, previously referred to A. SIMILIS, Jerdon, with the present species: and we feel little doubt that A. SIMILIS of the Indian peninsula will prove to be identical with ANTHUS CINNAMOMEUS of Rüppell. The S. Indian bird is very remarkable, among the MOTACILLIDÆ, for possessing an extremely rudimentary first primary.

\* The Prince of Canino, enumerating the species of this genus, gives one as C. BAGUEIRA; by which we presume that the Indian bird is intended. *Comptes Rendus*, XXXVIII (1854), p. .

† Dr. Rüppell refers this bird to MEGALOPHONUS, G. R. Gray; but the characters are rather those of the true ALAUDÆ, except that the legs and feet are comparatively small and weak. The wing has the short first primary minute, the third, fourth, and fifth equal and longest, and the second and sixth are scarcely shorter. A. ERYTHROPYGIA, Strickland, from Kordofan (*P. Z. S. Nov.* 1850), is probably affined to it.

The true MEGALOPHONI (v. *Brachonyx*, Swainson,) were classed as MIRAFRÆ by Dr. A. Smith; and they seem to be merely weak-billed MIRAFRÆ, and resemble MIRAFRA in wanting the tuft of short bristly feathers over each nostril, which is characteristic of the more typical Larks. CETHILAUDA also wants this tuft, and MACRONYX (but the latter is a genus of *Pipits*, affined to the long-clawed CORYDALLÆ, as C. RICHARDI and C. RUFULA). Mr. G. R. Gray assigns to MEGALOPHONUS certain true Larks (possessing the nareal tuft) of S. Africa, which Dr. A. Smith classed as ALAUDÆ; but these constitute a peculiar form, CALENDULAUDA, *nohis*; ex. ALAUDA ALBESCENS, Lafr. (v. *A. codea*, A. Smith),—A. LAGEPA, A. Smith, &c.

The genus MIRAFRA, also, has hitherto been composed very heterogeneously. Confining it to the species devoid of nareal tufts, we therefore distinguish 1, SPIZALAUDA, *nohis*; ex. M. HAYI, Jerdon, which is a peculiar and rather thick-billed true Lark, as shewn by the form of the wing, &c.; and 2, ANNOMANES, Cabanis; ex. M. PHENICURA, Franklin,—AL. LUSITANIA, Gmelin (v. *deserti*, Licht., *isabellina*, Tem., et *M. phanicuroides*, *nohis*),—and probably M. CORDUFANICA, Strickland (*P. Z. S. Nov.* 26th, 1850), to which we suspect that *A. cinnamomea*, Bonap. (*Rev. Zool. &c.* 1851, p. 178), should be referred. (P. S. Since this note was first printed, we have learned of the prior establishment of the genus ANNOMANES; and that A. CINNAMONEA (CORDUFANICA?) is correctly referred to it; also the ALAUDA PALLIDA of Ehrenberg, which possibly

BUDYTES VIRIDIS (*Motacilla viridis*, Scopoli, founded on the bad figure in Brown's *Ill. Orn.* pl. 33, f. 2; *M. bistrigata*, Raffles; *B. melanocephala* et *B. bcema*, Sykes; *B. neglecta*, *melanocephala*, et *flava*, apud Jerdon, *Catal.*; *M. melanocephala*, Lichtenstein; *B. flava* vel *neglecta* et *B. Rayi* vel *flaveola* of India and the Malay countries, *auctorum*). Two specimens, from Abyssinia.

\*CRATEROPUS LEUCOPYGIUS, Rüppell. Abyssinia.

ERYTHROPYGIA GALACTOTES, (Tem.) Ditto.

\*LANIUS COLLARIS, L. Ditto.

ENNEOCTONUS RUFUS, (Brisson). Ditto.

\*LANIARIUS ERYTHROPTERUS, (Shaw). Ditto.

\*DRIOSCOPIUS CUBLA, (Latham). Ditto.

\*PLATYSTEIRA SENEGALENSIS, (L.) M. and F. Ditto.

MERULA OLIVACEA, (L.) Ditto.

\*THAMNOLEA SEMIRUFA (*Thamnobia* ? *semirufa*, Rüppell.)—Ditto. Altogether distinct from THAMNOBIA, which we conceive to be nearly affined to TROGLODYTES.

\*CERCOTRICHAS ERYTHROPTERUS, (L.) Ditto. This is a true *Sháma*; and the generic name CERCOTRICHAS, Boie, holds precedence of *Kittacincla*, Gould. Our museum now possesses three species,—C. ERYTHROPTERUS of Nubia, Abyssinia and Kordofan,—C. MACROURUS of India and the Malay countries,—and C. LUZONIENSIS (*Copsychus luzoniensis*, Kittlitz), of the Philippines.\*

—rather than LUSITANIA—may be identical with our *Mirafra phaenicuroides*, *passim*: but we have seen no description of ANN. PALLIDUS.)

There still remain 6 or 7 species of true MIRAFRA,—viz. 4 in India, M. ASSAMICA, M. AFFINIS, M. ERYTHROPTERA, and M. CANTILLANS,—a fifth in Java, M. JAVANICA,—a sixth in N. S. Wales, M. HORSFIELDI, Gould (which is affined to the Indian M. CANTILLANS), and Mr. Gould suspects another in N. Australia, larger and more nearly affined to M. JAVANICA. M. ASSAMICA is erroneously identified with the last-mentioned species by Mr. G. R. Gray.

N. B.—*M. flavicollis*, McClelland (*P. Z. S.* 1839, p. 163), is merely the female of EMBERIZA AUREOLA!

\* There can be no doubt that C. MACROURUS (which is often termed the *Indian Nightingale*) is the species familiarly referred to as “the Nightingale” by Dr. J. D. Hooker, in his ‘Himalayan Journal’ (I, 332, II, 146): the season which he states them to be in song (October), quite sufficing to shew that the real Nightingale cannot be intended. The true British Nightingale abounds in Persia, where it is termed *Bulbul-i-hazár-dástán*, or the “bird with a hundred tongues;” and many caged Nightingales are brought from that country to Afghánistán in the first instance, and thence to India; a few finding their way even to Calcutta, where they command a high price as song-birds, and are known as the *Bulbul bosta*. To the proper *Fauna Indica*, the veritable genus LUSCINIA is unknown.

PRATINCOLA RUBICOLA, (L.) Abyssinia.

\*PR. (?) SORDIDA, (Rüppell). Two specimens. Ditto.

\*SAXICOLA ISABELLINA, Rüppell. Ditto.

S. AURITA, Temminck. Ditto.

\*SYLVIA LEUCOPOGON, Meyer. (*S. passerina*, Temminck; *S. subalpina*, C. L. Bonap.) Egypt.

\*SALICARIA (?) CINNAMOMEA, Rüppell. Abyssinia. This curious little bird is apparently congeneric with the TRIBURA LUTEOVENTRIS, Hodgson, *P. Z. S.* 1845, p. 30, and *J. A. S.* XIV, 583; but as we have good specimens of neither for comparison, we can only thus indicate the affinity.

PHYLLOSCOPUS BONELLII, (Vieillot; *Sylvia Nattereri*, Temminck).

\*TCHITREA MELANOASTER, (Swainson). Abyssinia. In plumage like some specimens of TCH. AFFINIS, nobis, but the bill and feet much smaller.

\*HIRUNDO RIOCOURII, Savigny (*H. cahirica*, Licht.; *H. rustica orientalis*, Schlegel). Specimen from Abyssinia, with under-parts not more rufous than in ordinary *H. RUSTICA*, from which it certainly (the present specimen at least) is insufficiently distinguished.

\*H. MELANOCRISUS, Rüppell. Abyssinia.

\*H. (?) PRISTOPTERA, Rüppell. A highly interesting and separable form of Swallow, with minute bill and feet, and the outer margin of its first primary having the extremities of the filaments reverted into hooks, as in the N. American *H. SERRIPENNIS*, Audubon, which however is a COTILE (or burrowing bank Swallow).

\*ORIOLOUS MELOXITTA, Rüppell. Abyssinia.

\*NECTARINIA TAKAZE, (Stanley). M. and F. Abyssinia.

N. FORMOSA, (L.) M. and F. Ditto.

\*N. CRUENTATA, Rüppell. Ditto.

\*N. HABESSINICA, Ehrenberg. Ditto.

\*N. AFFINIS, Rüppell. Ditto.

\*N. METALLICA, Lichtenstein. Nubia.

\*ALSOCOMUS GUINEA, (L.) Abyssinia.

ALS. ARQUATRIX, (Tem.) Ditto.

\*TURTUR ERYTHROPHYS, Swainson. Two specimens are sent as *T. BISORIUS* apud Rüppell, one from Nubia, the other from Abyssinia. Both differ from the Indian Collared Turtle-dove (*T. BISORIUS verus*), and agree with that of S. Africa (*T. VINACEUS*), in having a much broader black semi-collar upon the nape. Both also are of a much paler hue than the S. African bird, especially on the crown. The Nubian is larger, the wing measuring 7 in. long, with its 1st primary  $\frac{3}{8}$  in. shorter than the next, the 2nd and 3rd equal, and the 4th  $\frac{1}{4}$  in. longer than the 1st; tail rounded, its outermost feathers  $\frac{5}{8}$  in. shorter than the medial. Colour

nearly as in the Indian bird, but the vinaceous hue of the neck and breast more intense; the axillaries, sides, and under surface of the wing, dark ashy, whereas in the Indian bird they are whitish; the tail also is more broadly tipped with white, and its lower coverts are ashy. The feet too are larger and coarser; and bill pale-coloured. This is clearly Mr. Swainson's *T. ERYTHROPHRYS*; whereas the Abyssinian species is, as decidedly, the

\**T. SEMITORQUATUS*, Swainson (though not well agreeing with Dr. Rüppell's figure of *SEMITORQUATUS*). Wing  $6\frac{1}{4}$  in. only; its 1st and 3rd primaries  $\frac{1}{8}$  in. shorter than the 2nd, and  $\frac{3}{8}$  in. longer than the 4th: tail sub-even, its outermost feather being  $\frac{1}{8}$  in. shorter than all the rest. Crown of the same vinaceous hue as the breast, scarcely infuscated, and devoid of ashy tinge; axillaries, sides, and under surface of wings, very pale ashy; and middle of belly and lower tail-coverts white. Bill black; and tarsi and toes conspicuously more slender and less coarse than in the preceding. From the very decidedly distinct form of the wings and tail, we do not hesitate to consider this as a distinct species from its various near congeners.\*

\* In the Cape species, *T. VINACEUS*, (Gm.), the 2nd and 3rd primaries are equal and longest, and the 1st and 4th are sub-equal, and  $\frac{1}{4}$  in. shorter than the preceding: outer tail-feathers  $\frac{5}{8}$  in. shorter than the medial. General colour much darker than in the others; the under-surface of wings dusky-ash; but the vent and lower tail-coverts are whitish.

*T. RISORIVS* of India has the third primary a little shorter than the 2nd, and the 1st  $\frac{1}{4}$  in. shorter, and the 4th  $\frac{3}{8}$  in. shorter, than the 2nd: tail-feathers sub-even, or slightly rounded, except the outermost pair, which are  $\frac{1}{2}$  in. shorter than the medial. Nuchal semi-collar much narrower than in the others, and no vinaceous hue on the nape below it; beneath the wings are whitish; and the vent and lower tail-coverts are of a full ash-grey.

*T. BITORQUATUS*, (Tem.), of Java, Timor, &c., is another fine species of this immediate sub-group, with the grey of the crown and wings, and the vinaceous of the neck and breast, deeper and brighter than in the others; black semi-collar moderately broad, and margined (more broadly above) with white; beneath the wings very dark ashy; and vent and lower tail-coverts white.

The Indian *T. HUMILIS*, (Tem.), is somewhat less affined to the rest, and is very remarkable (among the *COLUMBIDÆ*) for the diverse hue of the sexes.

Having now *five* closely affined and very similar wild species or distinct races of Collared Turtle-dove actually before us, the question arises, to which of them should the common domestic Collared Turtle-dove (so abundantly bred in cages) be referred, if indeed to any one of them? This domestic breed would seem to be of exceedingly remote antiquity, and was probably derived by the



*T. SENEGALENSIS*, (L. : *Col. cambaiensis*, Gmelin ; *C. ægyptiaca* ? Lath. ; *C. maculicollis* ? Wagler). Two specimens from Abyssinia differ from all the Indian we have seen, in having the colours distinctly broken on the scapularies, and more or less on the back ; the scapularies being of a dull

Hebrews from the Egyptians. The breadth of its black semi-collar points to an African rather than to an Indian origin. There can be little doubt that it is the "Turtle-dove" of our English version of the Pentateuch, repeatedly mentioned as the equivalent of a "young Pigeon" for a burnt-offering,—“a pair of Turtle-doves or two young Pigeons,”—and that it was abundantly propagated in cages as at present, and, therefore, always available. That our Indian *T. RISORIUS* is *not* (as currently supposed) the wild type of this domestic breed is indicated, firstly, by its very different voice or *coo*,—secondly, by its larger size, reversing the usual rule with domestic animals, and with the generality of tame Pigeons in particular, —and thirdly (as remarked before), the domestic Collared Turtle-dove has always a much broader black semi-collar than *T. RISORIUS*, in which it accords with the three wild races found in Africa. Of the latter, the Cape species (*T. VINACEUS*), and equally the Malayan (*T. BITORQUATUS*), may at once be set aside, for geographical reasons alone, besides that there are other objections : and of the two that remain, *T. SEMITORQUATUS* agrees best in size, and also in having white lower tail-coverts ; but the tail is more squared, and the feathers composing it are considerably broader, while the black bill seems to be a further objection. Comparison of voice would of course assist the enquiry. To the best of our judgment, not one of the five accords sufficiently ; and the genuine wild type may yet remain to be discovered, in another equally affined wild species, of which there may be several yet undesiscriminated. The tame breed is very true to its particular colouring, except when pure white, and the white are often matched with the ordinary blonde or cream-coloured Doves, producing an intermediate or pallid offspring : but the cream-colour has a decided look of domesticity, and is unlikely to have been the original hue. Mr. Selby assures us that “a mixed breed is often obtained between it and the common wild Turtle-dove” of Britain (*T. AURITUS*) ; “but the progeny are invariably *mules* and incapable of further increase,—a fact that has been established by many careful and oft-repeated experiments.” Jardine’s *Nat. Libr., Columbidae*, p. 172. The same experiments might easily be tried with the Indian *T. RISORIUS* ; only in this instance the affinity is undoubtedly closer.

(*P. S.*—Since the above was in type, we have seen the Prince of Canino’s *Coup d’Œil sur les Pigeons*, published in the ‘*Comptes Rendus*’ for 1854-5, and especially his remarks on the Turtle-doves (1845, pp. 15, 16). The particular subgroup of *T. RISORIUS* and its affines is designated by his Highness *STREPTOPELIA* ; and he refers to it four species from Africa, and five from Asia and its dependencies. The domesticated race is assigned (as currently) to *T. RISORIUS*. To judge from Dr. Rüppell’s figure, however, we should have referred the Abyssinian *T. LUGENS* to

fuscous-brown, with broad ferruginous tips, whereas in the Indian bird the two colours are completely blended, or there is (at most) but a faint indication of the *break*, which must be sought for to be observed. Savigny's coloured figure of the Egyptian bird must either represent a distinct species, or both size and colouring are exceedingly exaggerated.\*

\**CENA CAPENSIS*, (Latham). Abyssinia.

*PTEROCLES EXUSTUS*, (Tem.): female, from Nubia.

\**PT. SENEGALENSIS*, Lath. (*Pt. guttatus*, Licht.) Mas. Ditto.

\**CLAMATOR* (?) *ERKELII*, (Rüppell). Abyssinia.

\**GLAREOLA LIMBATA*, Rüppell. Two specimens. Ditto.

\**LOBIVANELLUS MELANOCEPHALUS*, Rüppell. Ditto.

\**L. SENEGALENSIS*, (L.; *Vanellus lateralis*, A. Smith). Ditto.

*SARCIOPHORUS CORONATUS*, (L.) Nubia.

\* „ *PILEATUS*, (L.) Ditto.

\* „ *MELANOPTERUS*, (Rüppell). Abyssinia.

\**METOPIDIUS AFRICANUS*, (L.) Abyssinia.

*PHILOMACHUS PUGNAX*, (L.) Ditto.

*SYPHEOTIDES* (?) *VIGORSII*, A. Smith (*O. scolopacea*, Tem.; *O. ruficrista*, A. Smith, *apud nos.*, *Catal.*) S. Africa.

\**S. MELANOGASTER*, (Rüppell). Female. Abyssinia. Closely affined to the Bengal Floriken (*S. BENGALENSIS*); but shorter in the tarse, with some other distinctions.

*S. AFER*, (Latham). Two specimens. S. Africa.

\**SCOPUS UMBRETTA*, (L.) Abyssinia.†

the group of *Turtures auriti*; and, of this latter group, may remark that *T. RUPICOLA*, (Pallas,) replaces *T. MEENA* in the Simla and Masuri hills. *T. DUSSUMIERI*, (Tem.), “with broad collar, from Malasia and the Philippines,” we have never seen from continental Malasia (*i. e.* the Malayan peninsula); where *T. TIGRINUS* abounds, distinct alike from *T. SURATENSIS* and *T. CHINENSIS*. *STR. GAIMARDI*, C. L. Bonap., “with much narrower collar, and much shorter toes,” than *STR. DUSSUMIERI*, is described from the Marianne Islands; and the fifth Asiatic species of *STREPTOPELIA* is the Indian *HUMILIS*, so remarkable for the diversity of the sexes.)

\* The Prince of Canino separates the Indian and N. African races.

† Mr. Frith remarks the affinity of this curious genus for *ANASTOMUS*; *vide* especially the young of the latter. We suspect, from the figures we have seen of that extraordinary and gigantic wader from the White Nile, lately described by Mr. Gould as *BALENICEPS REX*, that this latter bears much the same relationship to *SCOPUS*, that *CANCROMA* does to *ARDEA* and especially *NYCTICORAX*. *BAL-*

\**CICONIA ABDIMII*, Licht. (genus *Sphenorhynchus*, Hemprich; *Abdimia*, and the species—*Abd. sphenorhyncha*, C. L. Bonap.) Ditto.

*ARDEA PURPUREA*, (L.) Two specimens. Ditto.

*HERODIAS ASHA*, (Sykes; *A. gularis*, Bosc.; *H. pannosa*? Gould). From the Red Sea. We have long suspected the identity of these; and so far as the present specimen enables an opinion to be formed on the subject, our suspicions are confirmed: but it is still desirable to compare adults in breeding livery. (The Prince of Canino admits all three as distinct. *Comptes Rendus*, 1855, p. 720.)

*H. BUBULCUS*, (Savigny). Sent as *H. Veranii*, (Roux), from Egypt. This is the third specimen which we have received as *H. Veranii*, the others being respectively from Sicily and Algeria. We cannot perceive in them the slightest difference in size, proportions, or colouring, from the common Buff-backed Egret of India and Java; and, therefore, can only regard them as of one species.

*NYCTICORAX GRISEUS*, (L.) Adult and young (the latter remarkable for the strong rufous tinge on its great alars and caudals); from Abyssinia.

\**FULICA CRISTATA*, L. Two specimens. Ditto.

*GALLINULA CHLOROPUS*, (L.) Ditto.

*THALASSEUS BENGALENSIS*, (Lesson): *Sterna media* (?), Horsfield; *St. affinis*, Rüppell; *St. Torresii*, Gould; *Sterna*, Jerdon's *Catal.* No. 402). A species widely diffused over the Indian Ocean, from the shores of India and Africa to those of Papua and Australia. Specimen from the Red Sea; exactly resembling another from the Bay of Bengal: while a third, from Singapore, in winter dress (like that originally described by M. Lesson), exhibits the greater development of black upon the primaries noticed by Dr. Pucheran in *Rev. Zool. &c.* 1850, p. 544.\*

*STERNA HIRUNDO*, L. From the Red Sea. Identical with specimens from Europe and S. India.

\**PLECTROPTERUS GAMBENSIS*, (Latham). Abyssinia.

\**DENDROCYGNA VIDUATA* apud Rüppell. Young, from Abyssinia. This can hardly be the same species as *D. VIDUATA*, (L., *vera*), from S. Ame-

*NICEPS*, *SCOPUS*, and *ANASTOMUS* are all African forms, the last having also a peculiar Indian species. (The African species heretofore referred to *ANASTOMUS*—*A. LAMINIGERUS*, Tem.,—is the type of *HIATOR*, Reichenbach.)

\* There can be little doubt also of the identity of *St. velox*, Rüppell, with *TH. CRISTATUS*, (Stephens, nec Swainson, v. *St. pelicanoides*, King); from the Indian Ocean, China, and N. Australia. We have a specimen from the Maldives, and another from the Tenasserim coast.

rica; figured in Griffith's Translation of and Commentary on Cuvier's *Régne Animal*, VIII, 671.

*ANAS ERYTHORHYNCHA*, (L.) Two specimens. Ditto.

\**A. LEUCOSTIGMA*, Rüppell. Ditto.

\**A. RUPPELLI*, nobis, *n. s.* Sent as *A. PÆCILORHYNCHA*, from Central Africa. A smaller bird than *A. PÆCILORHYNCHA* (*vera*, which was originally described from Ceylon), with closed wing measuring  $9\frac{1}{2}$  in. : beak to forehead  $1\frac{7}{8}$  in. ; and tarse  $1\frac{1}{2}$  in. Colour nearly as in the common Indian bird, but with the head and neck uniformly streaked; whereas *A. PÆCILORHYNCHA* has the crown and stripe through the eyes dusky, and supercilium and rest of head and neck whitish, with minute dusky specks: wing-speculum much the same; but *A. PÆCILORHYNCHA* has the entire outer web of the larger tertiaries white, while *A. RUPPELLI* has only their extreme outer border white. The rump and upper and lower tail-coverts in *A. PÆCILORHYNCHA* are uniformly dark-coloured, and brightly glossed with green in the male; in *A. RUPPELLI* they are variegated like the back and belly. Lastly, the bill of the latter is more than proportionally smaller, much less gibbous at base, and differently coloured. In *A. PÆCILORHYNCHA* the gibbous triangle on either side of the advanced frontal feathers is of a bright orange-colour; the tip of the bill, with the posterior half of the *dertrum*, intense yellow;\* and the rest black: in *A. RUPPELLI* the bill is chiefly yellow, with merely a portion of its upper surface and the *dertrum* black. The legs also appear to be infuscated, instead of bright coral-red as in the other.

*PHALACROCORAX AFRICANUS*, (Gm.) Adult, from Abyssinia. M. Malherbe previously favoured us with an example of the young of this species, from Algeria.†

Of reptiles, one species only is sent, *PSAMMOSAURUS SCINCUS*, (Merrem), *v. griseus*, (Daudin), from Nubia: and

Of fishes, only *CHROMIS BOLTI*, Cuv., from the Nile.

\* Erroneously coloured red in Hardwicke's figure.

† The following presumed identifications may be here suggested.

*DRYMOICA INORNATA*, (Sykes, 1832), with *DR. MYSTACEA*, Rüppell (1835).

*DR. GRACILIS*, Rüppell (1835), with *DR. LEPIDA*, nobis (1844).

*MELANOCORYPHA BIMACULATA*, Menetries, with *M. TORQUATA*, nobis, *J. A. S. XVI*, 476. (The latter is not a true *MELANOCORYPHA*, but the type of *CALANDRINA*, nobis.)

*PELICANUS CRISPUS*, Bruch, with *P. PHILIPPENSIS* (*v. roseus* et *manillensis*), Gmelin: nec *P. JAVANICUS*, Horsfield, which in India is equally common; while *P. ONOCROTALUS* (*verus*) is rare.

2. Capt. S. R. Tickell, Maulmein. A collection of bird-skins, from the mountainous interior of the Tenasserim provinces. This collection contains several new species; and among them is the female of apparently an undescribed Hornbill.

BUCEROS TICKELLI, nobis, *n. s.* Length 25 or 26 in.; of wing 12 in.; and tail 11 in. Bill  $4\frac{1}{2}$  in. from forehead, and 2 in. in greatest vertical depth, at  $\frac{1}{4}$  of its length from base; the basal half of the upper mandible gibbous, or pinched up (as it were) into a sharp keel, which descends more abruptly upon the forehead (where concealed by the erect frontal feathers), and slopes evenly forwards till it disappears, at about  $\frac{2}{3}$  of the length of the bill from base. Occipital crest ample; the feathers open-webbed, and with those of the crown fuscous-brown with narrow pale mesial line to each: upper-parts uniform dark fuscous-brown, with a slight gloss of green; the middle pair of tail-feathers coloured like the back, but the rest much darker, or glossy green-black,—as are likewise the primaries and secondaries, which are more or less margined with brown (nearly as in *B. GALERITUS*): some pale feathers at base of the winglet; and the 3rd to the 7th primaries (inclusive) have their outer web emarginated successively further from the base, the commencement of the emarginated portion of each being somewhat broadly edged with fulvous-white: primaries and rectrices tipped with dull white, more or less speckled with dusky: the entire under-parts dull rusty-isabelline, except the feathers at the base of the lower mandible, which are coloured like those of the crown: in texture the feathers of the lower-parts are loose and open-webbed, especially on the throat and front of neck. Bill intermixed dusky and yellowish-white, passing to yellow on the imperfectly developed casque.

This conspicuously distinct species from any other Hornbill which we have seen, was found by Capt. Tickell “confined to the great hills (the continuation of the Himalaya and Yo-ma-tsung) which run N. and S. through the Tenasserim provinces, and form the back-bone of the Malayan peninsula. They are wild and wary, and keep to the summits of such colossal trees that it is no wonder Mr. Barbe and other collectors in this country never procured a specimen. I believe, however, that no European has ever been into those jungles besides myself. This Hornbill and *B. PUSARAN* have a steady even flight. All the others I have seen, viz. *CAVATUS*, *ALBIROSTRIS*, *NIPALENSIS*, *PICA*, and *BIROSTRIS*, proceed with those singular flappings and sailings, so peculiar to this genus: and it is strange that these two species should offer so marked a distinction.”\*

\* Capt. Tickell has subsequently forwarded a more elaborate description of this Hornbill, for publication in the Society's Journal.



*PARUS SUBVIRIDIS*, Tickell, *n. s.* Affined to *P. XANTHOGENIS* and *P. SPILONOTUS*; but the whole of the under-parts dull yellowish-green without a trace of black, passing to ashy on the vent and lower tail-coverts: back much the same, but darker, with the feathers centred yellower, imparting a mottled appearance: crown and nape black, a few of the posterior long crest-feathers tipped with yellow: feathers at base of bill, the lores, cheeks and sides of neck, supercilia, and mesial nape-streak, bright yellow: wings and tail dull black, the great alars and caudals margined with ashy, and two or three of the primaries with whitish; a conspicuous white patch also at the base of the primaries; and the tertiaries are tipped on the outer web with an elongate whitish spot, this hue also extending up the inner web of the smallest tertiary: the smallest wing-coverts are tipped with ashy, and the first great range of wing-coverts with white upon both webs, the second range upon the outer web only; forming two cross-bands on the wing: the anterior half of the wing is white underneath, but the axillaries are light yellow: the outermost tail-feather has its exterior web dull white, and a spot of the same tipping the inner web; this spot being successively smaller on the penultimate and ante-penultimate tail-feathers: bill black; and legs plumbeous. Length about  $4\frac{3}{4}$  in.; of wing  $2\frac{3}{4}$  in.; and tail 2 in.: longest crest-feathers  $\frac{5}{8}$  in.

“Shot at an elevation of 3,500 ft. The *PARI* are very uncommon in the Tenasserim forests. In fact,” remarks Capt. Tickell, “this is the only one I have seen.”

*PTERUTHIUS AERALATUS*, Tickell, *n. s.* Quite similar to *PT. ERYTHROPTERUS* of the Himalaya, excepting that the latter has constantly the tertiaries wholly ferruginous in both sexes. In the Tenasserim bird, the female has the tertiaries greenish golden-yellow, like the secondaries, with merely a tinge of ferruginous upon the shaft and on the inner web only of each; and the male differs from that of the Himalayan bird by having nearly the whole outer webs of the tertiaries bright golden-yellow, the smallest having also a black tip and inner edge, the next a black tip to the outer web only, the third and longest an oblique and elongated black tip to the outer web only, and the feather succeeding this (or last of the secondaries) has also a mark  $\frac{7}{8}$  in. long on its outer web of mingled ferruginous and golden-yellow. We also cannot perceive, in the male sent by Capt. Tickell, any trace of the carneous tinge, seen particularly on the flanks posteriorly of *PT. ERYTHROPTERUS*; and the female has the under-parts, with the exception of the white throat only, much more fulvescent than the under-parts of the female *PT. ERYTHROPTERUS*. The two species or races indeed manifest much the same relation-

ship to each other, as do *SERILOPHUS LUNATUS* (Gould), of Burma, and *S. RUBROPYGUS*, (Hodgson), of the S. E. Himalaya. The Tenasserim *PTERUTHIUS* was "found at an elevation of 3,500 to 4,500 ft."

*GARRULAX STREPITANS*, Tickell, *n. s.* One of the *G. BELANGERI* and *G. LEUCOLOPHOS* series. Crown and occiput rich tawny-brown; the nareal plumes, lores, cheeks and chin, blackish, passing into dull tawny-brown on the throat and front of the neck, and to a more ferruginous brown on the ear-coverts posteriorly: a large patch of white on the sides of the neck, pure and strongly contrasting with the dark crown and ear-coverts, but shading off gradually to ashy on the middle of the nape, the back, and sides of the breast: the ashy of the back shades off to greenish olive-brown on the rump, wings, and flanks, also on the vent, lower tail-coverts, and tibial plumes; passing on to blackish on the tail: breast and middle of the belly ashy, the pectoral feathers tawny-brown anteriorly. Bill and feet black. Length about 11 in.; of wing  $4\frac{1}{4}$  in.; and tail 5 in., its outermost feather 1 in. shorter: bill to forehead  $1\frac{1}{8}$  in.; and tarse  $1\frac{1}{2}$  in.

"Common from 3,000 to 5,000 ft., and pre-eminently noisy."

*G. MELANOSTIGMA*, nobis, *n. s.* Affined to *G. ERYTHROCEPHALUS* and *G. RUFICAPILLUS*. Entire crown very bright rufo-ferruginous, contracting along the occiput: small frontal plumes, lores, and chin, black: sin-cipita and cheeks ashy, with black mesial streaks, more developed on the ear-coverts: general hue greenish olive-brown, having a tawny tinge on the nape, sides of neck, breast and middle of the belly, the breast being paler: throat and front of the neck rufo-ferruginous, shading into the duller hue of the breast: wings and tail bright greenish golden-yellow; the coverts of the primaries deep black, forming a conspicuous patch, and the next range of coverts bright ferruginous inclining to cinnamon-colour: secondaries and tertiaries conspicuously tipped with blackish. Bill black; and legs brown. Length about  $10\frac{1}{2}$  in.; of wing  $4\frac{1}{8}$  in.; and tail  $4\frac{1}{2}$  in., its outermost feathers  $1\frac{1}{4}$  in. shorter: bill to forehead 1 in. or nearly so; and tarse  $1\frac{1}{2}$  in.

"Common, and found with the last; but ranging higher still, up to the vast wall-like crags of Moolé-it; 7,500 ft. Sexes alike."\*

\* The extraordinary development of this genus demands a new Conspectus of the species, for which the Society's museum affords better materials than perhaps any other. We have vainly tried to arrange them satisfactorily into minor groups; and cannot follow Mr. G. R. Gray in adopting the three headings of *GARRULAX*, *TROCHALOPTERON*, and *PTEROCYCLOS* (the last pre-occupied in Malacology). The species not in the Society's museum are here distinguished by an asterisk.

TURDINUS CRISPIFRONS, nobis, n. s. Very like T. MACRODACTYLUS (*Malacopteron macrodactylum*, Strickland, v. *Brachypteryx albogularis*,

1. G. BELANGERI, Lesson, *Zoologie du Voyage de M. Belanger*, p. 258, with coloured figure: *Ianthocincla leucolophos*? var., apud nos, J. A. S. X, 924. Common in Pegu and the Tenasserim provinces.

2. G. LEUCOLOPHOS; *Corvus leucolophos*, Hardwicke (Gould's 'Century,' pl. 18). Himalaya; Asám; Khásya hills; Arakan.

\*3. G. PERSPICILLATUS; *Turdus perspicillatus*, Gmelin; Shaw's 'Zoology,' X, 325; *le Merle de la Chine*, Buffon. China.

\*4. G. BICOLOR, Müller; *Rev. Zool. &c.*, 1844, p. 402. Nearly affined to the three preceding species. From the west of Sumatra.

\*5. G. MITRATUS, Müller. Of this we have seen no description.

6. G. STREPITANS, Tickell, *ut supra*.

\*7. G. CINEREIFRONS, Kelaart, nobis, J. A. S. XX, 176. Mountains of Ceylon.

\*8. G. DELESSERTI; *Crateropus Delesserti*, Jerdon, *Madr. Journ.* X, 256 (*Ill. Ind. Orn.*, pl. 13): *Cr. griseiceps*, Delessert. Nilgiris.

9. G. CHINENSIS; *Lanius chinensis*, Scopoli: *Corvus auritus*, Gmelin: *Turdus shanho* et *T. melanopsis*, Gmelin; *Crateropus leucogenys*, nobis, J. A. S. XI, 180. China; and also Tenasserim provinces (Ye): *vide J. A. S. XXIII*, 732. Remarkable for the rigidity of its frontal plumes.

10. G. CÆRULATUS; *Cinclosoma cærulatum*, Hodgson, *As. Res.* XIX, 147. S. E. Himalaya.

11. G. RUFICOLLIS; *Ianthocincla ruficollis*, Jardine and Selby (*Ill. Orn.* 2nd series, pl. 21): *I. lunaris*, McClelland and Horsfield. S. E. Himalaya; Asám; Sylhet; Tippera.

\*12. G. RUFIFRONS; *Crateropus rufifrons*, Swainson, 2 $\frac{1}{4}$  Centen. p. 290: *G. rubrifrons*, Lesson. Java.

13. G. ALBOGULARIS; *Ianthocincla albogularis*, Gould, *P. Z. S.* 1831, p. 187: *Cinclosoma albigula*, Hodgson, *As. Res.* XIX, 146. Himalaya; Khásya hills.

\*14. G. GULARIS; *Ianthocincla gularis*, McClelland and Horsfield, *P. Z. S.* 1839, p. 159. Asám.

\*15. G. MCCLELLANDII, nobis, J. A. S. XII, 949: *Ianthocincla pectoralis* apud McClelland and Horsfield, *P. Z. S.* 1839, p. 160. Asám. (Qu. G. MONILIGER, No. 17?)

16. G. PECTORALIS; *Ianthocincla pectoralis*, Gould, *P. Z. S.* 1835, p. 186: *Cinclosoma grisaure*, Hodgson, *As. Res.* XIX, 146: *G. melanotis*, nobis, J. A. S. XII, 149 (var.) Himalaya; Arakan; Tenasserim provinces.

17. G. MONILIGER; *Cinclosoma moniliger*, Hodgson, *As. Res.* XIX, 147. S. E. Himalaya; Asám; Tippera; Arakan; Tenasserim provinces.

18. G. MERULINUS, nobis, J. A. S. XX, 521. Khásya hills.

Hartlaub), of the Malayan peninsula (described *J. A. S.* XIII, 382); but smaller and non-rufous, with longer, softer, and more graduated tail, and

19. *G. OCELLATUS*; *Cinclosoma ocellatum*, Vigors, *P. Z. S.* 1831, p. 55. (Gould's Century, pl. 15). Himalaya.

20. *G. RUFOGULARIS*; *Ianthocincla rufogularis*, Gould, *P. Z. S.* 1835, p. 48: *Cinclosoma rufimentum*, Hodgson, *As. Res.* XIX, 148. Himalaya; Khásya hills; Tippera.

21. *G. SQUAMATUS*; *Ianthocincla squamata*, Gould, *P. Z. S.* 1835, p. 47: *Cinclosoma melanura*, Hodgson, *As. Res.* XIX, 147. (Jardine and Selby, *Ill. Orn.*, 2nd series, pl. 4). S. E. Himalaya; Khásya hills.

22. *G. SUBUNICOLOR*, Hodgson, *J. A. S.* XII, 952, XIV, 599. S. E. Himalaya.

23. *G. AFFINIS*, Hodgson, *J. A. S.* XII, 950. Nepal.

24. *G. VARIEGATUS*; *Cinclosoma variegatum*, Vigors, *P. Z. S.* 1831, p. 55: *G. Abeillei*, Lesson. (Gould's 'Century,' pl. 16). N. E. Himalaya.

25. *G. CHRYSOPTERUS*; *Ianthocincla chrysoptera*, Gould, *P. Z. S.* 1835, p. 48. S. E. Himalaya.

26. *G. ERYTHROCEPHALUS*; *Cinclosoma erythrocephalum*, Vigors, *P. Z. S.* 1831, p. 171. (Gould's 'Century,' pl. XVII.) N. W. Himalaya; Nepal (*nec* Sikim).

27. *G. RUFICAPILLUS*, nobis, *J. A. S.* XX, 521. Khásya hills.

28. *G. MELANOSTIGMA*, nobis, *ut supra*. Tenasserim provinces.

29. *G. PHÆNICEUS*; *Ianthocincla phænicea*, Gould (*Icones Avium*): *Crateropus puniceus*, nobis, *J. A. S.* XI, 180. S. E. Himalaya; Khásya hills.

30. *G. (?) CACHINNANS*; *Crateropus cachinnans*, Jerdon, *Madr. Journ.* X, 255 (et pl. 7): *Cr. Lafresnayei*, Ad. Delessert; *Cr. Delesserti*, La Fresnaye (*nec* DELESSERTI, Jerdon). Nilgiris.

31. *G. (?) JERDONI*, nobis, *J. A. S.* XX, 522. Nilgiris.

32. *G. (?) LINEATUS*; *Cinclosoma lineatum*, Vigors, *P. Z. S.* 1831, p. 55: *Cinclosoma setiferum*, Hodgson, *As. Res.* XIX, 148; *C. striatum* (?), Royle's list. Himalaya generally; Alpine Punjab.

33. *G. (?) IMBRICATUS*, nobis, *J. A. S.* XII, 951. Butan.

*N. B.*—*G. Feliciæ*, Lesson, = *LEIOTHRIX STRIGULA* (Hodgson), v. *Muscicapa variegata*, Ad. Delessert, and *Leiothrix chrysocephala*, Jameson.

The last two species approximate the division *ACTINODURA*, Gould; to which are referred—

1. *A. EGERTONI*, Gould, *P. Z. S.* 1836, p. 18: *Leiocincla plumosa*, nobis, *J. A. S.* XII, 950. (Figured in Gould's 'Birds of Asia.') S. E. Himalaya; Asám: Khásya hills. And

2. *A. NIPALENSIS*; *Cinclosoma nipalense*, Hodgson, *As. Res.* XIX, 145. (Also figured in Gould's 'Birds of Asia.') S. E. Himalaya. Then follows—

erect, short and stiff frontal plumes, which are much less developed in the other species: the rictal bristles are also much slighter. Length

\**LEIOPTILA ANNECTANS*, nobis, *J. A. S.* XVI, 450. Sikim. And, lastly, the genus *SIBIA*, Hodgson, comprising—

1. *S. PICOIDES*, Hodgson, *J. A. S.* VIII, 38: *Heterophasia cuculopsis*, nobis, *J. A. S.* XI, 187. S. E. Himalaya.

2. *S. GRACILIS*; *Hypsipetes gracilis*, McClelland and Horsfield, *P. Z. S.* 1839, p. 159; *J. A. S.* XVI, 149, XX, 521. Asám; Khásya hills.

3. *S. CAPISTRATA*; *Cinclosoma capistratum*, Vigors, *P. Z. S.* 1831, p. 85: *C. melanocephalum* (?), Royle's list: *S. nigriceps*, Hodgson, *J. A. S.* VIII, 38. Himalaya generally.

It is very remarkable that no species of this group has hitherto been noticed from the Malayan peninsula; and two or three only, as yet, in the great islands: but Capt. Tickell's recent discovery of two new species in the mountainous interior of the Tenasserim provinces renders it likely that others will yet be met with further south, when the loftier regions of the interior come to be explored. A recent author observes, that "although Malacca birds are among the very commonest in European collections, I am not aware that the country has been visited by any ornithologist. \* \* \* There are two Portuguese resident in Malacca, whose sole business is procuring and selling the skins of mammalia and birds. They have numbers of the Malays of the interior in their employ, whom they furnish with ammunition, arseniated soap, &c. All the birds are skinned and put up by these Malays, who are paid a small sum per skin. The greater part of the birds thus come from one or two localities only, where, as this collecting has been going on for years, there can hardly be a new bird to be found." *Ann. Mag. N. H.*, Feb. 1855. Yet this author (Mr. A. R. Wallace) mentions certain species as having been procured by himself, during his nine weeks stay at Malacca, which we have never seen in collections from that neighbourhood, that had been purchased of the dealers referred to; and other species as being there common, which we have rarely seen in such collections (*NECTARINIA HYPOGRAMMICA* for example). It is very evident that the more dull-coloured species, and also those which are particularly abundant about the station (unless of remarkably shewy plumage), are neglected. *ALCEDO BERYLLINA*, Vieillot (v. *A. biru*, Horsfield), is stated to occur there, and Helfer mentions it as an inhabitant of the Tenasserim provinces; but we have seen it from neither portion of that range of country, though likely enough to occur; and, of restricted *ALCEDO*, only *A. EURYZONA*, Tem., *A. MENINGTING*, Horsf., and *A. BENGALENSIS*, Gmelin (the common Indian bird). Mr. Wallace's *HALCYON GULARIS* is probably the Indian *H. SMYRNENSIS*, which abounds in the Malayan peninsula, and accords precisely with the late Mr. Strickland's description of a Smyrna specimen! A Woodpecker is mentioned as "like *HEMICERCUS CONCRETUS*, but with head and crest of the same colour as the body."



about  $7\frac{1}{2}$  in.; of wing 3 to  $3\frac{1}{4}$  in.; and tail 3 to  $3\frac{1}{4}$  in.; its outermost feather  $\frac{3}{4}$  in. shorter: bill to gape 1 in.; and tarse the same. Colour deep non-rufous olive-brown, the feathers of the head, neck, and back, pale-shafted, and margined with black; a pure white speck at the tip of the smallest tertiary, and sometimes to that of the next, and probably of more: throat pure white, marked with dark olive, but differently from that of *T. MACRODACTYLUS*; in the latter species the feathers surrounding the throat are more or less broadly black-tipped; but in *T. CRISPIFRONS* they are black medially, with white outer edge and extreme tip, and the dark markings are less abruptly defined and do not surround and circumscribe the throat as in the other species: lower-parts tinged with ashy, mingled with whitish along the middle. Bill dusky, pale underneath and at tip; and legs dark olive-brown. "Not uncommon, but very local, and confined entirely to deep thickets amongst rocks."

*T. BREVICAUDATUS*, nobis, *n. s.* A third and more aberrant species, remarkable for its short tail, in which respect the Malayan *T. MACRODACTYLUS*, (Strickland), is intermediate to this and the preceding species. Size comparatively small. Length about  $5\frac{1}{2}$  in., of which tail  $1\frac{5}{8}$  in.; its outermost feather  $\frac{3}{8}$  in. shorter than the medial: closed wing  $2\frac{1}{2}$  in.; more rounded than in the two other species, having the sixth to the tenth primaries sub-equal and longest: bill to gape  $1\frac{3}{8}$  in.: tarse  $\frac{7}{8}$  in. Colour of the upper-parts much as in the preceding species, but somewhat more rufescent, and the feathers still softer and less elongated; of a rich olive-brown, black-bordered, and paler towards shaft; at forehead inclining to ashy, and scarcely stiffened: plumage over the rump discomposed, and excessively dense and copious: throat mingled dusky and whitish; and rest of the lower-parts weak ferruginous, deepest on middle of belly, vent

Can this be the adult female of *H. CONCRETUS*, which has the head and crest plain ashy? Whereas the young female has these parts fulvous, and the young male has the crown fulvous and the lengthened occipital crest dull crimson; the adult male having a crimson crown and ashy crest! The beautiful *MACROPTERYX COMATUS* is a novelty, as inhabiting the Malayan peninsula: also *PERICROCOTUS MINIATUS*, Tem. (if rightly identified,—we have seen the Indian *PER. SPECIOSUS* from Pinang!); "*IXOS ANALIS*, Horsf." is probably *PYCNONOTUS CROCOPHOREUS*, Strickland. Mr. Wallace's *MUSCIPETA PARADISEA* is doubtless our *TCHITREA AFFINIS*, which it quite distinct from *TCH. PARADISI (vera)* of India: and his *PHYLLORNIS ICTEROCEPHALUS*, Tem., is doubtless *PH. COCHINCHINENSIS*, Lath., *apud nos*.—*Buceros nigrirostris*, nobis, proves (from this gentleman's observation) to be the female of *B. MALAYANUS*, Raffles (*v. anthracinus*, Tem.); of which Dr. S. Muller considered it to be a permanent variety.

and lower tail-coverts: a series of whitish terminal specks on the great range of wing-coverts, and others tipping the secondaries and tertiaries. Bill dusky above, pale below; and legs pale, with whitish claws.

These birds belong to a group which is pre-eminently difficult of classification, *viz.* the great *TIMALIA* series, which attains its maximum of development in the Malayan peninsula. As a genus or sub-genus, it is barely separable from *TRICHASTOMA*, nobis, and this again from *MALACOPTERON*, *ALCIPPE*, nobis (exemplified by *BRACHYPTERYX SEPIARIA*, Horsfield, and numerous other species affined to it). *TURDINUS* is distinguished by its robust form and especially by its peculiarly mottled plumage, the feathers being mostly pale-shafted and black-edged. It is not distantly affined to *PELLORNIVUS*.\*

*POMATORHINUS HYPOLEUCOS*, nobis, *var.?* (*J. A. S. XIII*, 371; *XIV*, 599). Specimen remarkable for having narrow white mesial streaks to the feathers of the nape, chiefly towards the sides of the nape, which we can perceive no trace of in Arakan specimens; and similar well defined but wider streaks on the dark ash-coloured sides of the breast, which are little more than indicated in the Arakan specimens under examination. Bill to gape 2 in. Perhaps a distinct variety, more probably merely a particularly fine adult, of *P. HYPOLEUCOS*.†

\* In a preceding note, we cited a paper on Malacca birds, by Mr. A. R. Wallace. The species which he remarked to be most abundant, were the different Bulbuls, "and the various strong-legged birds forming the genera *TIMALIA*, *MACRONOUS*, &c. These latter birds are found to be abundant both in species and individuals, when carefully searched for on the sides of roads and other places where there is a thick low jungle; while the former are found on every fruit-tree and about the Malay villages. Their affinities are most interesting and puzzling. I have eight species of birds," he adds, "all of an obscure dusky-olive plumage and nearly of the same size, which can only be distinguished by minute differences in the bill, or obscure markings in various parts of the plumage. They appear to belong to the genus *TRICHASTOMA*, Blyth; and are mostly fruit-eating birds, though they also feed freely on insects." Yet, although so common, we can rarely glean a specimen from the Malacca collections got up by the Portuguese dealers, which consist of the same ever recurring gaudy-coloured skins, *usque ad nauseam*. It may be inferred that a large proportion of the *TIMALIA* and *MALACOPTERON* series yet remain to be described.

† With reference to this species, Capt. Tickell writes—"I must beg to demur about its being classed in *POMATORHINUS*. Examine narrowly the bill, which will be found softer in texture (this, however, in a dry skin cannot be well perceived), and sub-cylindrical; whereas *POMATORHINUS* has the bill exceedingly

*P. ALBOGULARIS*, nobis, *n. s.* Though most closely affined to *P. PHAYREI*, nobis (*J. A. S. XVI*, 452), of the Arakau and Khásya hills, we consider this to be evidently a distinct race. It is a larger bird than *P. PHAYREI*, with the upper-parts of a finer and richer tawny hue, especially on the crown, and the lower-parts of a much fainter rufous; the white upon the throat is more extended, and passes gradually into the rufescent hue of the breast; the feathers at the base of the lower mandible are pure white, whereas in *P. PHAYREI* the upper half of them are black; there is also much more white on the upper-part of the loreal region, and the supercilia are broader and purer white. Length of wing  $3\frac{7}{8}$  in.; of middle tail-feathers  $4\frac{1}{2}$  in.; and of bill to gape  $1\frac{1}{4}$  in. Specimen male.

(Of three closely affined species of this genus, *P. RUBIGINOSUS*, nobis, of Sikim, is distinguished by its black crown, and the deep rufo-ferruginous colour of its breast and long pointed loreal feathers; the hue of the upper-parts is also more rufescent than in the others: *P. PHAYREI*, nobis, of the Khásya and Arakan hills, has the crown of the same tawnyish olive-brown as the back, and the lower-parts are of a much weaker rufo-ferruginous than in *P. RUBIGINOSUS*; the loreal feathers are short, and the white supercilium is narrower than in the others and of the same breadth throughout: *P. ALBOGULARIS* has the lower-parts merely tinged with rufo-ferruginous; but the upper-parts are of rather a bright tawny-brown, and a supercilium commences from a large triangular white loreal patch, which is conspicuously bordered above with black. All have the cheeks and sides of the neck black; and the bill bright coral-red, which soon fades in the stuffed specimen, it being perhaps of a yellower coral-red in *P. PHAYREI*).

Both *P. HYPOLEUCOS* (var.?) and *P. ALBOGULARIS* were procured by Capt. Tickell at the base of Moolé-it, at an altitude of 5 to 6,000 ft.\*

compressed and hard. Then the shape of the head with its flat sinciput, and the fan-like broad tail."—Should it be deemed advisable to detach *P. HYPOLEUCOS* from *POMATORHINUS*, a second and rather less typical species exists in *P. ERYTHROGENIS* of the Himalaya; and the Australian type, with very differently shaped wing, is still more distinct and separable.

\* Of this genus, also, no species appears as yet to have been described from the Malayan peninsula; though there can be little doubt of its occurrence in the more elevated interior. In the islands, we know only of *P. MONTANUS*, Horsfield, in Java, *P. BORNENSIS*, Cabanis, in Borneo, and *P. ISIDOREI*, Lesson, in New Guinea; all of which belong to the Indian type as distinguished from the Australian type of *POMATORHINUS*, which latter constitutes the *POMATOSTOMUS*, Cabanis, *hodiè*.

*PHYLLOSCOPUS VIRIDIPENNIS*, nobis, *n. s.* A fourth species of the *Reguloides* subgroup (*J. A. S.* XXIII, 487), and most nearly resembling *PH. CHLORONOTUS*; but readily distinguished from that species by having the rump uniformly coloured with the back, also by having a longer and differently coloured bill, and legs of much darker hue. From *PH. PROREGULUS* (*Regulus modestus*, Gould), it is distinguished by its inferior size and much brighter colouring; the mesial coronal streak being as much developed as in *PH. CHLORONOTUS*, and of a purer yellowish-white contrasting with a blacker shade of dusky: edge of wing considerably brighter yellow than in the others; the wing-band and also the tibial plumes tolerably bright yellow, the latter constituting another good distinction: but a further and more conspicuous distinction consists in the wing beyond its coverts being uniformly green, without a trace of the *REGULUS*-like variegation seen in *PH. PROREGULUS*, and less conspicuously in *PH. CHLORONOTUS*: there is no dusky patch posterior to the coverts, nor whitish tip or border to any of the great alars; but the secondaries are broadly margined with tolerably bright green, and the tertiaries are merely of a duller green throughout, brightening on their outer edge, and are not dusky and contrasting (as in the other species). In brief, *PH. VIRIDIPENNIS* may be described to have the upper-parts vivid olive-green, brightest on the margins of the wing and tail feathers: lower-parts albescent tinged with yellow: crown dusky mixed with green, with bright yellowish-white supercilia and coronal streak continued over the occiput, the supercilia more yellowish anteriorly: a broad pale yellow wing-band formed by the tips of the great coverts of the secondaries; and the smaller range of wing-coverts slightly tipped with yellowish: tibial plumes bright yellowish: the margin of the wing pure canary-yellow: upper mandible wanting in the specimen, but the lower is wholly yellow. Legs infuscated-brownish. Length about 4 in., of which tail  $1\frac{5}{8}$  in.: wing 2 in.; having the short first primary  $\frac{9}{16}$  in., the second  $\frac{3}{4}$  in. longer than the first, and  $\frac{3}{8}$  in. shorter than the longest primaries. Bill to gape  $\frac{1}{2}$  in.; and tarse  $\frac{5}{8}$  in.

*HYPSSIPETES TICKELLI*, nobis, *n. s.* Very like *H. MACLELLANDII*, Horsfield; but devoid of rufous tinge on the breast and lower-parts, which are uniformly coloured with the throat, and the throat-feathers are less elongated and pointed than in the other: axillaries bright yellow; and much of the under surface of the wing pale sullied yellow: lower tail-coverts dull yellow: upper-parts dull olive-green, slightly washed with rufous on the back; the wings and tail brightish golden-green, much less rufescent than in *H. MACLELLANDII*: crown dingy rufous-brown, the

feathers pale-shafted and pointed, but less elongated than in the other: ear-coverts dull greyish; and a very faint tinge of ferruginous on the sides of the neck. Bill dusky; and legs pale brown. Bill to gape  $1\frac{1}{2}$  in.; the latter defended by strong *vibrissæ*: closed wing 4 in.: tail the same: tarse  $\frac{5}{8}$  in.

ARBORICOLA BRUNNEOPECTUS, Tickell, *n. s.* On a former occasion, *J. A. S.* XVIII, 819, we distinguished three species of the Green or Hill Partridges of Anglo-Indian sportsmen,—viz. *A. TORQUEOLA* (*Perdix torqueola*, Valenciennes; *P. megapodia*, Temminck; v. *P. olivacea*, Gray); which appears to be the only species found in the Simla and Masuri hills, and in Sikim inhabits at a greater elevation than the next:—*A. RUFOGULARIS*, nobis, common in Sikim, and which Capt. Tickell has now sent from the Tenasserim mountains; and *A. ATROGULARIS*, nobis, which is common in the mountains of Asám, Sylhet, if not also those of Arakan. We have since seen many dozens of living examples of the last from Sylhet, and remarked that there is no apparent sexual diversity, and but slight individual variation; and this we now suspect to be also the case with the second species, the supposed females referred to which formerly we now suspect were that sex of *A. TORQUEOLA*. Capt. Tickell now sends a specimen of a fourth, found together with *A. RUFOGULARIS* at an elevation of from 3000 to 5000 ft. “They are tame and easily shot as they run along the ground.” In *A. RUFOGULARIS*, both sexes appear to have the chin and throat deep ferruginous, the former speckled with black, the latter with an inferior black border more or less developed: breast dark ashy, tolerably pure, and passing to white on the middle of the belly: flanks varied with ferruginous on the sides of the feathers, which have an elongated medial white spot, less developed than in the males of *A. TORQUEOLA*: back plain, or with but the faintest possible indication of terminal dusky margins to the feathers (which must be looked for to be observed at all): the scapularies with large black spots, and scarcely any trace of white medial lines; and the crown brown, often black-spotted, and passing to ashy on the forehead.—*A. ATROGULARIS* has a very broad white moustachial streak; and the throat black, passing into white below, the latter ill defined and spotted with black. the spots gradually disappearing on the pure ashy breast: no trace of ferruginous on the flanks, which have small narrow white spots, often obsolete or nearly so: crown brown, more or less black-spotted, and passing to ashy on the forehead; and the back conspicuously barred with black, two or three narrow transverse bands upon each feather: scapularies with black spots more or less developed, but with no white mesial streaks, and little trace of rufous or ferruginous.



—A. BRUNNEOPECTUS has the breast and flanks tawnyish-brown instead of ashy, with no admixture of ferruginous on the latter, which are spotted quite differently from those of any of the other species; each feather having a large rounded white spot, broad black terminal border, and another spot of black above the white: throat fulvous-white, passing to black in front of the neck, but no white below this as in A. ATROGULARIS, nor do the black spots descend visibly upon the breast, though on turning up the feathers, a rudiment appears upon each of the black and white markings which become so developed on the flanks: crown brown, black-spotted, and passing to whitish-brown on sides of forehead: back and scapularies scarcely differing from those of A. ATROGULARIS. Beak (of specimen examined) conspicuously larger than in the others.

A. INTERMEDIA, nobis, *n. s.* We believe this to constitute a fifth species, *probably* from Arakan. It has a black throat, succeeded by a great palish ferruginous patch which nearly surrounds the neck, and is in front spotless, but has large round black spots on the sides of the neck: rest of the plumage nearly as in A. RUFOGULARIS, but the general colour paler.

The other species sent by Capt. Tickell are ATHENE CUCULOIDES, MEGALAIMA FRANKLINII, HEMICERCUS CANENTE, CHRYSOCOLAPTES SULTANEUS, GECINUS CHLOROLOPHUS, PHENICOPHAUS CURVIROSTRIS, HARPACTES ERYTHROCEPHALUS, LYNCEORNIS CERVINICEPS, PSILORHINUS SINENSIS (var.), ALCIPE NIPALENSIS, STACHYRIS NIGRIFRONS, TEPHRODORNIS PELVICA, TURDUS RUFULUS,\* PRATINCOLA INDICA, CYORNIS RUBECULOIDES, CORYDON SUMATRANUS, EURYLAIMUS JAVANICUS, SERILOPHUS LUNATUS, PSARISOMUS DALHOUSIÆ, PERICROCOTUS——?,† CAMPEPHAGA FIMBRIATA, HIRUNDO URBICA(!),‡ TCHITREA AFFINIS, CRINIGER FLAVEOLUS, IOLE VIRESCENS, HEMIXOS FLAVALA, PHYLLORNIS HARDWICKII, PH. AURIFRONS, and PH. SONNERATII.

Of the Owl, he remarks—"If this be true CUCULOIDES, there is a species in the Sikim hills hitherto unnamed; but which I used to suppose

\* T. RUFULUS, Dapiez; *T. modestus*, Eyton: Qu. T. JAVANICUS (?), Horsfield; *T. concolor* (?), Temminck.

† Capt. Tickell insists that the specimen sent is the female of P. BREVIROSTRIS: to us it appears rather that of P. SOLARIS, nobis; having a pale throat and dark forehead.

‡ Capt. Tickell writes—"There are great numbers of these here" (at Maulmein) "in the season; and I have also seen large flocks of them in India, but they appear from time to time, not constantly as does H. RUSTICA."

was CUCULOIDES. It is coloured almost exactly like A. BRODIEI, from which it differs in its much larger size. The bird I now send is the Tenasserim substitute for my A. RADIATA, which it almost exactly resembles in note and habits: being diurnal and crepuscular; whereas A. BRODIEI and the other above alluded to are strictly nocturnal, and have a very different note."—We can detect no difference between this and other Tenasserim specimens, and others from the Himalaya, and one from Chusan; and have repeatedly received examples from Asám, Sylhet, and Arakan.

"The Barbet," continues Capt. Tickell, "I have shot at Darjiling, where it is not common.\* But in the Tenasserim mountains it swarms from 3,000 to 5,000 ft. elevation, not higher, nor lower,—and from the first level it suddenly and entirely supplants M. LINEATA, the *Pokoung* of the Burmese. As long as day lasts, the woods amongst the Dauna hills resound with its cry—*piow, piow, piow*, &c. &c. There is another Barbet, smaller and resembling apparently the M. INDICA, which is also pretty common, from 1,000 to 3,500 ft.; but it settles *solely* on the summits of the hugest trees, calling out *tapral, tapral, tapral*, by the hour together; and I have found it impossible to procure with the gun: so small an object at such a vast height cannot be hit.† Mr. Parish, our chaplain, was with me on one of my excursions, and measured the trunk of one of these giants of the forest which had fallen across a little brook. The smooth bole, before a single limb branched out, was 130 ft. long."

THE PHENICOPHAUS CURVIROSTRIS and PHYLLORNIS SONNERATII have heretofore been only known as Malasian species. The former was observed by Capt. Tickell "on low jungly hills,—very like PH. TRISTIS in habits: scarce: a pair shot were both precisely similar, except in colour of iris; the male having that cobalt blue, and the female orange. Food *Coleoptera*, *Hemiptera*, and very large caterpillars.

"HARPACTES ERYTHROCEPHALUS was common in the hills from 3,000 ft. upwards. Below that it is replaced by H. ORESKIOS. It flies in small troops, and is active and vociferous in the morning, solitary and quiet during the heat of the day, sitting in the shade. It appears larger and brighter than in Nepal and Sikim." The specimens sent are certainly brighter than, but do not exceed in dimensions, others from Darjiling, Sylhet, &c.

\* Mr. Hodgson procured it in Nepal; and we have received it from the Klásya hills, and from those of Arakan.—*Cur. As. Soc.*

† Probably M. TRIMACULATA (var. *cyanotis*). *Cur. As. Soc.*

The *PSILORHINUS SINENSIS*, (L.), var., is of the same race which we formerly termed *Ps. magnirostris* in *J. A. S.* XV, 27; the great size of the bill proving merely to be an individual peculiarity; but the colouring is considerably finer and more intense than in Himalayan specimens, which latter (as we are assured) are perfectly similar to examples from China.

The *ALCIPPE NIPALENSIS* (v. *Siva nipalensis*, Hodgson,) was "common, but local, in hilly jungles up to 4,000 ft. I found," adds Capt. Tickell, "*LEIOTHRIX ARGENTAUROS* and *SIVA STRIGULA*, about the sides of Moolé-it. *STACHYRIS NIGRICEPS*, in hilly forests, 3000 ft. *CORYDON SUMATRANUS* is a singular and rare bird. Of its habits little or nothing is known. I can only say that it is crepuscular (very likely diurnal as well), and so stupid and tame as to allow itself to be pelted without moving. *EURLAIMUS JAVANICUS* is not common: at least it is not often seen; being very quiet and secluded, though excessively tame, and not crepuscular like *CORYDON*. *SERILOPHUS LUNATUS*. These birds are much freer flyers than *EURLAIMUS*. I found them once, in a flock, hurrying about like Titmice, but very high up. *CALYPTOMENA VIRIDIS*. These birds resort to dense thickets when alarmed, but will sally out to feed on fruit (wild figs, &c.), and they mingle with Barbets and other birds in so doing. The note is low and sweet—a mellow whistle. Like the *EURLAIMI*, they are tame and stupid.\*

"I obtained," continues Capt. Tickell, "the egg of *BUCEROS CAVATUS*; and "have seen with my own eyes that the male builds the female in, by covering the hole in the tree, where she incubates, with mud, leaving only room for her bill to protrude and receive food from his! I thought that this was a fable." (The same is stated in the Rev. J. Mason's 'Tenas-serim,' &c., p. 274.) Of mammalia, Capt. Tickell "got nothing particular. Indeed, I never saw a country so utterly void of large game."

Finally, he obtained the young, about a month old, of the large pouched *Hargila* (*LEPTOPTILOS ARGALA*). The fact of this bird breeding in the Provinces was long ago announced to us by Capt. Sparkes; who stated—"With regard to the 'Adjutant's' nest, I was out surveying in December, 1848, in the district of Moulmein, at a place about five miles to the east of the town; and having occasion to ascend some eminence to obtain a

\* Of *PSARISOMUS DALHOUSIE*, Mr. Frith informs us, that flocks often ascend to the table-land of Cherra Punji; where, as they fly across the open ground from garden to garden, the native boys hunt them by intercepting and turning their flight away from the gardens, when they are soon fatigued and easily caught by the hand.

good *coup d'ail* of the surrounding country, I determined to climb to the top of the highest peak of the Kharong hills, a detached mass of limestone rock which rises almost perpendicularly out of an extensive level plain, to the height of 600 feet. The ascent was extremely difficult and dangerous, and had never before (as the people assured me) been attempted by an European. On gaining the summit I found that I was immediately over the top of a large tree—which sprung from a crevice in the rock below: and on its highest branches was an 'Adjutant's' nest, composed of dry sticks very rudely interlaced [or merely heaped together?] making a flat platform as it were, with little or no perceptible cavity towards the centre. In this were two young 'Adjutants,' about the size of small Geese, covered with a *white* down, and with pouches and beaks ridiculously disproportioned to their size, being extraordinarily large. Both of the young were taken by one of my Burmese servants. In another similar nest, in an adjoining tree, were one young one, and one addled egg, of a *spotless dirty white* and somewhat larger than a Turkey's egg."

Mr. R. W. G. Frith informs us that he found both of the species of 'Adjutant' breeding in the S. E. part of the Sundarbáns. Their nests were placed on the tops of the loftiest trees, and were extremely difficult and hazardous to approach, from the density of the undergrowth and the great number of Tigers which infest the vicinity. In fact the nests were only to be approached by means of the tracks made by Rhinoceroses, Buffaloes, &c., through the jungle. The large or pouched species breeds about a month earlier in the season than the other, immediately (it would seem) after its arrival from the places which it frequents during the rainy season. They are then in the finest state of plumage; ash-grey, with the pale wing-band complete; and, for the most part, they have but just perfected their plumage when they leave Calcutta at the end of the rains. In the same neighbourhood, Mr. Frith was credibly assured that the huge *ARDEA GOLIATH*, Rüppell (*A. nobilis*, nobis, &c.),\* also bred; and he expects to be able to procure the eggs of all three species during the next breeding season.

A further notice of the 'Adjutant' may be here cited. In Lower Bengal, we see the adult birds only during the rains; though the young remain throughout the year, congregating about *abattoirs* and such places. At Masuri, Capt. Hutton remarks—"The 'Adjutant' is a sure forerunner of the rains with us, appearing always about a fortnight before they

\* These are recognised as distinct by the Prince of Canino. *Comptes Rendus*, XL (1855), p. 722.

commence. They do not alight on the hills, but are seen soaring about high above us in circles. I have seen them regularly every year; and in 1843 noted their first appearance on the 2nd June. They appear to come from the interior towards the plains. I have never seen them *during the rains* on the hills nor in the Deyra Doon."

It is not generally known that our large pouched *Hargila* is also an African bird. Dr. Rüppell notices its occurrence in Nubia and Abyssinia in small flocks.

E. BLYTH.

*Corrigenda, for Report for February Meeting, pp. 178 ante.*

- p. 178, l. 3 from bottom. "For NYCTICIGUS," read NYCTICEJUS.  
 „ 179, „ 2. For "ceiniger," read CRINIGER.  
 „ „ note, l. 2. For "*Coccothrauses*," read *Coccothraustes*.  
 „ 180, „ 12. For "Tenasserin," read Tenasserim.  
 „ „ „ 13. For "TINUNCULUS," read TINNUNCULUS.  
 „ „ „ 19. For "CYANOGARULUS," read CYANOGARRULUS.  
 „ „ „ 24. For "CERÆRA," read CERĒBA.  
 „ „ „ 25. For "MARILARDICA," read MARILANDICA.

LIBRARY.

The following additions have been made to the library since the last meeting.

*Presented.*

Mittelsyrien und Damascus, Geschichtliche Ethnographische und Geographische Studien, von Alfred V. Kremer. Wien, 1853, 8vo.—BY THE AUTHOR.

Description de l'Afrique par un Géographe Arabe anonyme du sixieme Siecle de l'Hègire. Text Arabe publié pour la premiere fois par M. A. de Kremer. Vienne, 1852, 8vo.—BY THE EDITOR.

Report of the Calcutta Public Library, for 1854.—BY THE CURATORS.

Thirty-second Annual Report of the Parental Academic Institution and Doveton College.—BY THE PRINCIPAL.

The Upadeshak, No. 99.—BY THE EDITOR.

The Calcutta Christian Observer, No. for March, 1855.—BY THE EDITORS.

The Oriental Baptist, No. 99.—BY THE EDITOR.

Notice Historique sur M. M. Burnouf, Pere et Fils. Par M. Roudet. Paris, 1854, Pamphlet, 4to.—BY THE AUTHOR.



*Exchanged.*

The Athenæum, for December, 1854.

The Calcutta Review, for December, 1854.

The Philosophical Magazine, No. 56.

*Purchased.*

The Annals and Magazine of Natural History, for January, 1855.

Comptes Rendus, Nos. 23 to 26 of 1854 and 1 of 1855.

Journal des Savants, for December, 1855.

Amír Hamzah, 1 vol. 4to.

March 31st, 1855.

RA'JENDRALA'L MITTRA.

*Meteorological Register kept at the Office of the Secretary to Government, N. W. P. Agra, for the month of February, 1855.*

Maximum pressure observed at 9.50 A. M.

| Date. | Barometer. | Temperature. |         |           | Direction of Wind. | Quantity of Rain. | Aspect of the Sky.          |
|-------|------------|--------------|---------|-----------|--------------------|-------------------|-----------------------------|
|       |            | Of Mercury.  | Of Air. | Wet Bulb. |                    |                   |                             |
| 1     | 29.715     | 63.5         | 65.0    | 53.0      | W.                 | ..                | Clear                       |
| 2     | 29.665     | 65.0         | 66.6    | 55.4      | W.                 | ..                | ✓ scattered towards hor.    |
| 3     | 29.619     | 65.5         | 66.5    | 55.9      | S. E.              | ..                | ✓ scattered                 |
| 4     | 29.679     | 65.0         | 66.4    | 55.5      |                    | ..                | Clear                       |
| 5     | 29.673     | 66.0         | 68.7    | 58.2      | N. E.              | ..                | Ditto                       |
| 6     | 29.805     | 66.9         | 68.5    | 56.0      | N.                 | ..                | Ditto                       |
| 7     | 29.755     | 64.4         | 65.4    | 55.0      | N.                 | ..                | Ditto                       |
| 8     | 29.629     | 66.9         | 67.7    | 56.0      | S. W.              | ..                | Ditto                       |
| 9     | 29.555     | 69.          | 70.9    | 58.4      | N.                 | ..                | Ditto                       |
| 10    | 29.639     | 69.9         | 71.8    | 58.6      | N. E.              | ..                | Ditto                       |
| 11    | 29.561     | 71.5         | 72.9    | 62.0      | E.                 | ..                | Ditto                       |
| 12    | 29.577     | 68.9         | 69.9    | 58.0      | N. E.              | ..                | Ditto                       |
| 13    | 29.543     | 66.6         | 68.3    | 58.0      | N. W.              | ..                | Ditto                       |
| 14    | 29.609     | 69.0         | 70.3    | 56.4      | N. W.              | ..                | Ditto                       |
| 15    | 29.487     | 68.9         | 69.9    | 56.0      | N. W.              | ..                | ✓ scattered all over        |
| 16    | 29.497     | 71.0         | 73.8    | 59.0      | N. E.              | ..                | Clear                       |
| 17    | 29.491     | 71.9         | 74.0    | 58.4      | N. E.              | ..                | ✓ scattered                 |
| 18    | 29.489     | 66.0         | 64.0    | 62.0      | N. E.              | ..                | ✓ all over                  |
| 19    | 29.409     | 64.8         | 64.6    | 62.5      | E.                 | ..                | ✓ scattered                 |
| 20    | 29.475     | 65.0         | 65.2    | 58.5      | W.                 | ..                | Clear                       |
| 21    | 29.459     | 66.5         | 67.3    | 59.0      | N. W.              | ..                | Ditto                       |
| 22    | 29.509     | 65.9         | 67.4    | 59.4      | N. W.              | ..                | ✓ scattered                 |
| 23    | 29.479     | 71.1         | 71.7    | 62.0      | N. W.              | ..                | ✓ scattered towards hor.    |
| 24    | 29.555     | 70.0         | 71.0    | 64.0      | S.                 | ..                | ✓ scattered in zenith       |
| 25    | 29.535     | 72.2         | 74.3    | 62.1      | N.                 | ..                | Clear                       |
| 26    | 29.663     | 73.0         | 74.9    | 60.7      | N.                 | ..                | ✓ very few scat. in zenith. |
| 27    | 29.655     | 74.5         | 75.4    | 61.5      | N. W.              | ..                | Clear                       |
| 28    | 29.577     | 73.0         | 73.8    | 63.0      | S. E.              | ..                | ✓ scattered                 |
| Mean. | 29.582     | 67.2         | 69.5    | 58.7      | ..                 | ..                | ....                        |

Barometer Observations corrected for Capillarity only.

Symbols. {  
 \ Cirus.  
 \ Cirro strata.  
 > Cumuli.  
 > Cumulo strata.  
 \ Nimbi or Nimbus.

*Meteorological Register kept at the Office of the Secretary to Government, N. W. P. Agra, for the month of February, 1855.*

## Observations at apparent Noon.

| Date. | Barometer. | Temperature. |         |           | Direction of Wind. | Quantity of Rain. | Aspect of the Sky.      |
|-------|------------|--------------|---------|-----------|--------------------|-------------------|-------------------------|
|       |            | Of Mercury.  | Of Air. | Wet Bulb. |                    |                   |                         |
| 1     | 29.669     | 68.8         | 69.6    | 55.3      | W.                 | ..                | Clear                   |
| 2     | 29.619     | 70.0         | 72.0    | 55.5      | W.                 | ..                | ✓ scat. towards E. hor. |
| 3     | 29.583     | 69.8         | 72.1    | 57.8      | E.                 | ..                | ✓ scattered             |
| 4     | 29.655     | 67.2         | 68.5    | 56.3      |                    | ..                |                         |
| 5     | 29.633     | 70.8         | 73.8    | 59.0      | N. E.              | ..                | Clear                   |
| 6     | 29.779     | 71.0         | 72.4    | 57.0      | N.                 | ..                | Ditto                   |
| 7     | 29.695     | 70.9         | 71.7    | 56.0      | N. W.              | ..                | Ditto                   |
| 8     | 29.579     | 71.5         | 72.8    | 58.0      | W.                 | ..                | Ditto                   |
| 9     | 29.505     | 73.8         | 74.8    | 59.5      | S. W.              | ..                | Ditto                   |
| 10    | 29.575     | 75.5         | 77.3    | 61.0      | E.                 | ..                | Ditto                   |
| 11    | 29.525     | 79.3         | 80.7    | 63.0      | E.                 | ..                | Ditto                   |
| 12    | 29.543     | 75.2         | 77.0    | 59.9      | N.                 | ..                | Ditto                   |
| 13    | 29.513     | 74.2         | 75.6    | 60.0      | N. W.              | ..                | Ditto                   |
| 14    | 29.579     | 74.9         | 76.9    | 57.5      | N. W.              | ..                | Ditto                   |
| 15    | 29.447     | 75.5         | 76.5    | 57.5      | N. W.              | ..                | ✓ scattered towards W.  |
| 16    | 29.461     | 75.0         | 76.0    | 60.5      | E.                 | ..                | Clear                   |
| 17    | 29.447     | 75.0         | 76.0    | 62.6      | N. E.              | ..                | ✓ scattered             |
| 18    | 29.437     | 65.0         | 63.5    | 62.1      | N.                 | 092               | ✓ all over              |
| 19    | 29.369     | 66.7         | 66.9    | 64.1      | N. W.              | ..                | ✓ scattered             |
| 20    | 29.451     | 69.0         | 70.9    | 57.5      | S.                 | ..                | Clear                   |
| 21    | 29.407     | 70.4         | 71.6    | 60.2      | N. W.              | ..                | Ditto                   |
| 22    | 29.489     | 72.0         | 73.5    | 60.4      | W.                 | ..                | ✓ scattered towards S.  |
| 23    | 29.445     | 74.5         | 75.0    | 63.4      | S. E.              | ..                | ✓ very few scattered    |
| 24    | 29.517     | 73.5         | 73.6    | 62.5      | S.                 | ..                | Clear                   |
| 25    | 29.493     | 75.5         | 76.8    | 62.7      | N. W.              | ..                | Ditto                   |
| 26    | 29.635     | 76.4         | 78.0    | 60.7      | N. E.              | ..                | Ditto                   |
| 27    | 29.605     | 77.6         | 78.0    | 62.5      | E.                 | ..                | Ditto                   |
| 28    | 29.527     | 77.0         | 77.8    | 64.5      | S. E.              | ..                | ✓ scattered             |
| Mean. | 29.542     | 72.7         | 77.4    | 59.8      | ..                 | ..                | ....                    |

*Meteorological Register kept at the Office of the Secretary to Government, N. W. P. Agra, for the Month of February, 1855.*

Minimum pressure observed at 4 P. M.

| Date. | Barometer. | Temperature. |         |           | Maximum and Minimum. |          |       | Aspect of the Sky.  | Direction of Wind. | Quantity of Rain. |
|-------|------------|--------------|---------|-----------|----------------------|----------|-------|---------------------|--------------------|-------------------|
|       |            | Of Mercury.  | Of Air. | Wet Bulb. | Maximum.             | Minimum. | Mean. |                     |                    |                   |
| 1     | 29.609     | 74.5         | 74.3    | 54.5      | 74.7                 | 51.5     | 63.1  | \ scat. in zenith   | W.                 | ..                |
| 2     | 29.565     | 74.9         | 74.5    | 57.8      | 75.5                 | 53.2     | 64.35 | Clear               | N. W.              | ..                |
| 3     | 29.515     | 73.0         | 73.0    | 60.2      | 74.7                 | 59.5     | 67.1  | \ scattered         | E.                 | ..                |
| 4     | 29.597     | 72.0         | 72.3    | 57.5      | 72.5                 | 55.0     | 63.75 |                     |                    | ..                |
| 5     | 29.589     | 74.0         | 75.0    | 59.0      | 75.0                 | 55.0     | 65.0  | Clear               | N.                 | ..                |
| 6     | 29.729     | 74.8         | 75.0    | 58.0      | 74.2                 | 54.5     | 64.35 | \ scattered         | N. W.              | ..                |
| 7     | 29.655     | 75.3         | 74.6    | 60.0      | 74.6                 | 53.0     | 63.8  | Clear               | N. W.              | ..                |
| 8     | 29.505     | 76.8         | 75.0    | 60.5      | 78.8                 | 58.8     | 68.8  | \ scattered         | N. W.              | ..                |
| 9     | 29.475     | 78.5         | 79.0    | 60.5      | 79.0                 | 60.0     | 69.5  | Clear               | N. W.              | ..                |
| 10    | 29.519     | 79.9         | 81.0    | 62.0      | 80.9                 | 61.0     | 70.95 | \ scattered         | E.                 | ..                |
| 11    | 29.483     | 82.1         | 82.4    | 64.5      | 82.0                 | 62.5     | 72.25 | Clear               | E.                 | ..                |
| 12    | 29.477     | 81.9         | 82.2    | 62.2      | 82.0                 | 60.5     | 71.25 | Ditto               | N. W.              | ..                |
| 13    | 29.459     | 79.9         | 79.3    | 60.4      | 80.2                 | 59.0     | 69.6  | \ scattered         | N. W.              | ..                |
| 14    | 29.495     | 80.2         | 80.5    | 60.2      | 80.2                 | 57.0     | 68.6  | \ very few scat. in | N. W.              | ..                |
| 15    | 29.395     | 78.0         | 77.0    | 61.2      | 77.0                 | 57.5     | 67.25 | \ all over [zenith. | W.                 | ..                |
| 16    | 29.397     | 78.9         | 79.9    | 61.4      | 79.9                 | 60.5     | 70.2  | Clear               | N. E.              | ..                |
| 17    | 29.349     | 79.0         | 79.0    | 63.6      | 79.5                 | 62.7     | 71.1  |                     |                    | ..                |
| 18    | 29.405     | 67.2         | 67.0    | 62.3      | 67.0                 | 62.0     | 64.5  | \ scattered         | N.                 | ..                |
| 19    | 29.319     | 71.9         | 71.9    | 64.3      | 71.5                 | 60.5     | 66.0  | ? scattered         | N. W.              | ..                |
| 20    | 29.401     | 76.0         | 75.9    | 60.5      |                      |          |       | Clear               | W.                 | ..                |
| 21    | 29.389     | 77.3         | 77.0    | 61.9      |                      |          |       | Ditto               | N. W.              | ..                |
| 22    | 29.393     | 80.9         | 79.6    | 64.3      |                      |          |       | ? scattered [N. W.  | N. W.              | ..                |
| 23    | 29.385     | 78.0         | 77.5    | 63.5      |                      |          |       | \ scattered towards | N.                 | ..                |
| 24    | 29.471     | 77.5         | 77.2    | 63.0      |                      |          |       | ? scattered         | S. E.              | ..                |
| 25    | 29.447     | 78.9         | 79.2    | 64.1      |                      |          |       | ? ditto [zenith     | N. W.              | ..                |
| 26    | 29.571     | 81.5         | 82.5    | 62.8      |                      |          |       | ? very few scat. in | N. W.              | ..                |
| 27    | 29.505     | 81.0         | 82.0    | 63.4      |                      |          |       | \ scattered         | E.                 | ..                |
| 28    | 29.471     | 79.9         | 79.0    | 66.2      |                      |          |       | ? ditto             | S. E.              | ..                |
| Mean. | 29.484     | 77.2         | 77.1    | 61.4      | 76.8                 | 58.0     | 67.4  | ....                | ..                 |                   |

As the Max. and Min. Registers were out of order.  
Observations not taken from the 20th to the 28th of February.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of November, 1854.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Daily Means, &c. of the observations and of the hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempe-<br>rature during<br>the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|--------------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                             | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                                | o    | o     |
| 1     | 29.921                                          | 30.008                                    | 29.847  | 0.161   | 80.7                          | 87.2                                             | 76.2 | 11.0  |
| 2     | .859                                            | 29.932                                    | .799    | .133    | 81.1                          | 87.6                                             | 76.6 | 11.0  |
| 3     | .880                                            | .955                                      | .819    | .136    | 82.2                          | 88.0                                             | 78.0 | 10.0  |
| 4     | .882                                            | .961                                      | .824    | .137    | 80.8                          | 86.8                                             | 77.2 | 9.6   |
| 5     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                                  |      |       |
| 6     | .871                                            | .935                                      | .810    | .125    | 78.7                          | 83.6                                             | 75.0 | 8.6   |
| 7     | .870                                            | .918                                      | .834    | .084    | 74.3                          | 79.0                                             | 71.2 | 7.8   |
| 8     | .858                                            | .934                                      | .774    | .160    | 73.8                          | 77.6                                             | 70.2 | 7.4   |
| 9     | .979                                            | 30.039                                    | .900    | .139    | 76.4                          | 82.8                                             | 71.8 | 11.0  |
| 10    | 30.070                                          | .141                                      | 30.013  | .128    | 75.2                          | 82.0                                             | 69.0 | 13.0  |
| 11    | .080                                            | .142                                      | .031    | .111    | 74.2                          | 81.4                                             | 68.3 | 13.1  |
| 12    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                                  |      |       |
| 13    | .018                                            | .094                                      | 29.965  | .129    | 72.4                          | 81.0                                             | 65.2 | 15.8  |
| 14    | 29.986                                          | .061                                      | .929    | .132    | 74.4                          | 82.7                                             | 67.8 | 14.9  |
| 15    | .982                                            | .050                                      | .931    | .119    | 75.8                          | 82.5                                             | 70.9 | 11.6  |
| 16    | .992                                            | .074                                      | .939    | .135    | 75.4                          | 82.8                                             | 70.4 | 12.4  |
| 17    | 30.021                                          | .101                                      | .972    | .129    | 74.6                          | 82.8                                             | 68.6 | 14.2  |
| 18    | 29.997                                          | .075                                      | .928    | .147    | 72.6                          | 81.5                                             | 65.8 | 15.7  |
| 19    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                                  |      |       |
| 20    | 30.019                                          | .078                                      | .971    | .107    | 69.9                          | 78.8                                             | 63.0 | 15.8  |
| 21    | .054                                            | .126                                      | 30.006  | .120    | 70.2                          | 79.7                                             | 61.8 | 17.9  |
| 22    | .057                                            | .145                                      | 29.997  | .148    | 70.8                          | 79.6                                             | 63.6 | 16.0  |
| 23    | .025                                            | .085                                      | .955    | .130    | 71.0                          | 78.2                                             | 64.7 | 13.5  |
| 24    | .037                                            | .111                                      | .998    | .113    | 71.9                          | 79.6                                             | 65.4 | 14.2  |
| 25    | .072                                            | .150                                      | 30.024  | .126    | 71.5                          | 79.7                                             | 65.6 | 14.1  |
| 26    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                                  |      |       |
| 27    | .017                                            | .091                                      | 29.945  | .146    | 72.4                          | 79.6                                             | 65.6 | 14.0  |
| 28    | 29.997                                          | .061                                      | .933    | .128    | 72.6                          | 80.0                                             | 66.8 | 13.2  |
| 29    | 30.015                                          | .082                                      | .957    | .125    | 72.3                          | 80.4                                             | 66.0 | 14.4  |
| 30    | .052                                            | .136                                      | .994    | .142    | 72.5                          | 80.6                                             | 66.2 | 14.4  |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of November, 1854.*

Daily Means, &c. of the observations and of the hygrometrical elements  
dependent thereon. (Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | 77.7                            | 3.0                 | 76.2                | 4.5                          | 0.887                            | 9.56                                             | 1.48                                                                    | 0.866                                                               |
| 2     | 78.0                            | 3.1                 | 76.4                | 4.7                          | .893                             | .62                                              | .55                                                                     | .861                                                                |
| 3     | 79.0                            | 3.2                 | 77.4                | 4.8                          | .922                             | .91                                              | .63                                                                     | .859                                                                |
| 4     | 77.5                            | 3.3                 | 75.8                | 5.0                          | .876                             | .44                                              | .63                                                                     | .853                                                                |
| 5     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 6     | 76.1                            | 2.6                 | 74.8                | 3.9                          | .849                             | .19                                              | .22                                                                     | .883                                                                |
| 7     | 72.5                            | 1.8                 | 71.6                | 2.7                          | .766                             | 8.35                                             | 0.77                                                                    | .916                                                                |
| 8     | 71.8                            | 2.0                 | 70.8                | 3.0                          | .746                             | .15                                              | .83                                                                     | .908                                                                |
| 9     | 73.1                            | 3.3                 | 71.4                | 5.0                          | .761                             | .27                                              | 1.45                                                                    | .851                                                                |
| 10    | 70.7                            | 4.5                 | 68.4                | 6.8                          | .690                             | 7.51                                             | .86                                                                     | .801                                                                |
| 11    | 69.4                            | 4.8                 | 67.0                | 7.2                          | .659                             | .20                                              | .89                                                                     | .792                                                                |
| 12    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 13    | 67.4                            | 5.0                 | 64.9                | 7.5                          | .615                             | 6.74                                             | .86                                                                     | .784                                                                |
| 14    | 70.5                            | 3.9                 | 68.5                | 5.9                          | .692                             | 7.56                                             | .59                                                                     | .826                                                                |
| 15    | 71.9                            | 3.9                 | 69.9                | 5.9                          | .725                             | .88                                              | .66                                                                     | .826                                                                |
| 16    | 71.4                            | 4.0                 | 69.4                | 6.0                          | .713                             | .77                                              | .66                                                                     | .824                                                                |
| 17    | 70.0                            | 4.6                 | 67.7                | 6.9                          | .674                             | .36                                              | .84                                                                     | .800                                                                |
| 18    | 67.4                            | 5.2                 | 64.8                | 7.8                          | .613                             | 6.72                                             | .94                                                                     | .776                                                                |
| 19    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 20    | 64.9                            | 5.0                 | 62.4                | 7.5                          | .567                             | .23                                              | .75                                                                     | .781                                                                |
| 21    | 65.5                            | 4.7                 | 63.1                | 7.1                          | .580                             | .38                                              | .67                                                                     | .793                                                                |
| 22    | 66.6                            | 4.2                 | 64.5                | 6.3                          | .607                             | .68                                              | .52                                                                     | .815                                                                |
| 23    | 66.7                            | 4.3                 | 64.5                | 6.5                          | .607                             | .67                                              | .58                                                                     | .808                                                                |
| 24    | 67.8                            | 4.1                 | 65.7                | 6.2                          | .632                             | .94                                              | .54                                                                     | .818                                                                |
| 25    | 67.3                            | 4.2                 | 65.2                | 6.3                          | .621                             | .83                                              | .55                                                                     | .815                                                                |
| 26    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 27    | 68.5                            | 3.9                 | 66.5                | 5.9                          | .648                             | 7.10                                             | .50                                                                     | .826                                                                |
| 28    | 68.7                            | 3.9                 | 66.7                | 5.9                          | .653                             | .14                                              | .52                                                                     | .824                                                                |
| 29    | 68.0                            | 4.3                 | 65.8                | 6.5                          | .634                             | 6.94                                             | .64                                                                     | .809                                                                |
| 30    | 68.1                            | 4.4                 | 65.9                | 6.6                          | .636                             | .96                                              | .67                                                                     | .806                                                                |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in  
the month of November, 1854.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.      | Mean Height of the Barometer at 32° Fahit. | Range of the Barometer for each hour during the month. |         |         | Mean Dry Bulb Thermometer. | Range of the Temperature for each hour during the month. |      |       |
|------------|--------------------------------------------|--------------------------------------------------------|---------|---------|----------------------------|----------------------------------------------------------|------|-------|
|            |                                            | Max.                                                   | Min.    | Diff.   |                            | Max.                                                     | Min. | Diff. |
|            | Inches.                                    | Inches.                                                | Inches. | Inches. | o                          | o                                                        | o    | o     |
| Mid-night. | 29.982                                     | 30.078                                                 | 29.828  | 0.250   | 71.7                       | 79.2                                                     | 65.4 | 13.8  |
| 1          | .976                                       | .082                                                   | .819    | .263    | 71.2                       | 78.8                                                     | 64.8 | 14.0  |
| 2          | .967                                       | .073                                                   | .805    | .268    | 70.7                       | 78.6                                                     | 64.2 | 14.4  |
| 3          | .960                                       | .067                                                   | .790    | .277    | 70.4                       | 78.8                                                     | 63.9 | 14.9  |
| 4          | .958                                       | .056                                                   | .774    | .282    | 70.0                       | 78.3                                                     | 63.0 | 15.3  |
| 5          | .966                                       | .076                                                   | .781    | .295    | 69.5                       | 78.2                                                     | 62.6 | 15.6  |
| 6          | .986                                       | .088                                                   | .813    | .275    | 69.2                       | 78.0                                                     | 61.8 | 16.2  |
| 7          | 30.011                                     | .111                                                   | .848    | .263    | 69.3                       | 78.8                                                     | 62.2 | 16.6  |
| 8          | .037                                       | .128                                                   | .875    | .253    | 72.4                       | 80.8                                                     | 66.7 | 14.1  |
| 9          | .055                                       | .150                                                   | .897    | .253    | 74.8                       | 82.8                                                     | 70.2 | 12.6  |
| 10         | .051                                       | .144                                                   | .898    | .246    | 76.8                       | 84.2                                                     | 73.2 | 11.0  |
| 11         | .033                                       | .132                                                   | .888    | .244    | 78.8                       | 85.4                                                     | 75.2 | 10.2  |
| Noon.      | .003                                       | .107                                                   | .874    | .233    | 80.0                       | 86.4                                                     | 76.0 | 10.4  |
| 1          | 29.970                                     | .080                                                   | .842    | .238    | 80.8                       | 87.2                                                     | 73.6 | 13.6  |
| 2          | .949                                       | .059                                                   | .818    | .241    | 81.4                       | 87.6                                                     | 74.0 | 13.6  |
| 3          | .938                                       | .041                                                   | .803    | .238    | 81.2                       | 88.0                                                     | 71.2 | 16.8  |
| 4          | .936                                       | .033                                                   | .799    | .234    | 79.4                       | 86.6                                                     | 72.0 | 14.6  |
| 5          | .942                                       | .042                                                   | .803    | .239    | 78.1                       | 85.4                                                     | 72.0 | 13.4  |
| 6          | .951                                       | .052                                                   | .820    | .232    | 76.2                       | 84.0                                                     | 71.9 | 12.1  |
| 7          | .974                                       | .078                                                   | .846    | .232    | 75.0                       | 82.8                                                     | 70.2 | 12.6  |
| 8          | .991                                       | .087                                                   | .850    | .237    | 73.9                       | 81.6                                                     | 68.7 | 12.9  |
| 9          | 30.000                                     | .094                                                   | .861    | .233    | 73.1                       | 81.0                                                     | 68.2 | 12.8  |
| 10         | .002                                       | .112                                                   | .866    | .246    | 72.4                       | 80.6                                                     | 67.2 | 13.4  |
| 11         | 29.998                                     | .084                                                   | .865    | .219    | 71.9                       | 79.8                                                     | 66.2 | 13.6  |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in  
the Month of November, 1854.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon. (Continued.)

| Hour.          | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of Air. | Additional weight of va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| Mid-<br>night. | 69.7                            | 2.0                 | 68.7                | 3.0                          | 0.697                            | 7.64                                             | 0.79                                                                    | 0.906                                                             |
| 1              | 69.3                            | 1.9                 | 68.3                | 2.9                          | .688                             | .55                                              | .75                                                                     | .910                                                              |
| 2              | 68.9                            | 1.8                 | 68.0                | 2.7                          | .681                             | .48                                              | .70                                                                     | .914                                                              |
| 3              | 68.6                            | 1.8                 | 67.7                | 2.7                          | .674                             | .42                                              | .68                                                                     | .916                                                              |
| 4              | 68.2                            | 1.8                 | 67.3                | 2.7                          | .666                             | .33                                              | .67                                                                     | .916                                                              |
| 5              | 67.9                            | 1.6                 | 67.1                | 2.4                          | .661                             | .29                                              | .59                                                                     | .925                                                              |
| 6              | 67.6                            | 1.6                 | 66.8                | 2.4                          | .655                             | .23                                              | .58                                                                     | .926                                                              |
| 7              | 67.8                            | 1.5                 | 67.0                | 2.3                          | .659                             | .27                                              | .56                                                                     | .928                                                              |
| 8              | 69.5                            | 2.9                 | 68.0                | 4.4                          | .681                             | .47                                              | 1.13                                                                    | .869                                                              |
| 9              | 70.8                            | 4.0                 | 68.8                | 6.0                          | .699                             | .62                                              | .64                                                                     | .823                                                              |
| 10             | 71.6                            | 5.2                 | 69.0                | 7.8                          | .704                             | .64                                              | 2.19                                                                    | .777                                                              |
| 11             | 72.3                            | 6.5                 | 69.0                | 9.8                          | .704                             | .60                                              | .84                                                                     | .728                                                              |
|                |                                 |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| Noon.          | 72.7                            | 7.3                 | 69.0                | 11.0                         | .704                             | .59                                              | 3.22                                                                    | .702                                                              |
| 1              | 73.1                            | 7.7                 | 69.2                | 11.6                         | .708                             | .62                                              | .45                                                                     | .688                                                              |
| 2              | 73.3                            | 8.1                 | 69.2                | 12.2                         | .708                             | .62                                              | .65                                                                     | .676                                                              |
| 3              | 73.0                            | 8.2                 | 68.9                | 12.3                         | .701                             | .55                                              | .66                                                                     | .674                                                              |
| 4              | 72.3                            | 7.1                 | 68.7                | 10.7                         | .697                             | .52                                              | .10                                                                     | .708                                                              |
| 5              | 72.2                            | 5.9                 | 69.2                | 8.9                          | .708                             | .67                                              | 2.55                                                                    | .750                                                              |
| 6              | 72.2                            | 4.0                 | 70.2                | 6.0                          | .732                             | .95                                              | 1.71                                                                    | .823                                                              |
| 7              | 71.7                            | 3.3                 | 70.0                | 5.0                          | .727                             | .92                                              | .39                                                                     | .851                                                              |
| 8              | 71.3                            | 2.6                 | 70.0                | 3.9                          | .727                             | .94                                              | .07                                                                     | .881                                                              |
| 9              | 70.9                            | 2.2                 | 69.8                | 3.3                          | .722                             | .90                                              | 0.89                                                                    | .899                                                              |
| 10             | 70.4                            | 2.0                 | 69.4                | 3.0                          | .713                             | .81                                              | .79                                                                     | .968                                                              |
| 11             | 69.8                            | 2.1                 | 68.7                | 3.2                          | .697                             | .64                                              | .84                                                                     | .901                                                              |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in  
the month of November, 1854.*

Solar radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain. | Prevailing direction of the Wind. | General Aspect of the sky.                                                                                   |
|-------|-----------------------|-------|-----------------------------------|--------------------------------------------------------------------------------------------------------------|
|       | °                     | Inch. |                                   |                                                                                                              |
| 1     | 147.0                 |       | S.                                | Cloudless till 8 A. M. scattered ☉ till 4 P. M. Cloudless afterwards. Also fogs in the morning. [afterwards. |
| 2     | 142.5                 |       | S. or S. W.                       | Cloudless till 9 A. M. scattered ☉ or ☿                                                                      |
| 3     | 141.5                 |       | S. or S. W.                       | Scattered ☿ or ☉ the whole day.                                                                              |
| 4     | 140.0                 |       | S.                                | Cloudless till 6 A. M. scattered ☉ till 3 P. M. Cloudless afterwards.                                        |
| 5     | Sunday.               | 0.29  |                                   |                                                                                                              |
| 6     | ..                    | ..    | S. or E. or N.                    | Scattered ☿ till 6 A. M. cloudy afterwards, also drizzling at 4 & 6 P. M.                                    |
| 7     | ..                    | 0.28  | N. or N. E.                       | Cloudy and constantly drizzling.                                                                             |
| 8     | 109.0                 | 0.33  | N. or N. W.                       | Cloudy till 6 P. M. and constantly drizzling before sun rise. Cloudless from 7 P. M. to midnight.            |
| 9     | 137.0                 |       | N. W.                             | Cloudless till 7 A. M. scattered ☿ till 6 P. M. Cloudless afterwards.                                        |
| 10    | 137.0                 |       | N. W.                             | Cloudless the whole day.                                                                                     |
| 11    | 136.0                 |       | N. W. or W.                       | Ditto.                                                                                                       |
| 12    | Sunday.               |       |                                   |                                                                                                              |
| 13    | 139.0                 |       | W. or N. W.                       | Ditto. [afterwards.                                                                                          |
| 14    | 140.2                 |       | N. W.                             | Scattered ☿ or ☉ till 4 P. M. Cloudless                                                                      |
| 15    | 140.0                 |       | N. W.                             | Scattered ☉ till 4 P. M. Cloudless afterwards. [afterwards.                                                  |
| 16    | 136.0                 |       | N. W.                             | Cloudy more or less till 3 P. M. Cloudless                                                                   |
| 17    | 136.2                 |       | N. W.                             | Cloudless.                                                                                                   |
| 18    | 140.3                 |       | W. or N. W.                       | Ditto.                                                                                                       |
| 19    | Sunday.               |       |                                   |                                                                                                              |
| 20    | 136.0                 |       | W. or N. or N. W.                 | Ditto.                                                                                                       |
| 21    | 137.0                 |       | N. W. or N. high at 1 and 2 P. M. | Ditto.                                                                                                       |
| 22    | 135.0                 |       | N. or N. W.                       | Cloudless nearly the whole day.                                                                              |
| 23    | 120.0                 |       | N. or N. W.                       | Ditto.                                                                                                       |
| 24    | 135.9                 |       | N. or N. W.                       | Cloudless till 6 A. M. scattered ☿ till 5 P. M. Cloudless afterwards.                                        |
| 25    | 139.0                 |       | N. W. or N.                       | Cloudless till 4 A. M. scattered ☿ till 7 P. M. Cloudless afterwards.                                        |
| 26    | Sunday.               |       |                                   |                                                                                                              |
| 27    | 140.0                 |       | Calm or N. W.                     | Cloudless till 8 A. M. Various kinds of clouds afterwards.                                                   |
| 28    | 142.4                 |       | N. W.                             | Cloudless till 5 A. M. scattered ☿ or ☉ till 1 P. M. Cloudless afterwards.                                   |
| 29    | 137.0                 |       | N. W.                             | Cloudless nearly the whole day.                                                                              |
| 30    | 135.0                 |       | N. W.                             | Ditto.                                                                                                       |

☿ Cirri, ☿ Cirro-strati, ☉ Cumuli, ☿ Cumulo-strati, ☿ Nimbi, — Strati, ☿ i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in  
the month of December, 1854.*

Latitude 22° 33' 1" North, Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the Level of the Sea 18.11. <sup>feet</sup>

Daily Means, &c. of the Observations, and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 30.053                                          | 30.144                                    | 29.987  | 0.157   | 72.5                          | 79.9                                          | 65.8 | 14.1  |
| 2     | .029                                            | .108                                      | .967    | .141    | 72.8                          | 81.0                                          | 66.5 | 14.5  |
| 3     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 4     | .032                                            | .100                                      | .995    | .105    | 72.8                          | 81.2                                          | 67.5 | 13.7  |
| 5     | .066                                            | .134                                      | 30.017  | .117    | 71.9                          | 79.2                                          | 65.4 | 13.8  |
| 6     | .054                                            | .140                                      | .002    | .138    | 69.6                          | 77.4                                          | 63.0 | 14.4  |
| 7     | .011                                            | .082                                      | 29.952  | .130    | 68.2                          | 72.0                                          | 64.9 | 7.1   |
| 8     | .000                                            | .051                                      | .966    | .085    | 69.6                          | 76.5                                          | 63.8 | 12.7  |
| 9     | .018                                            | .104                                      | .963    | .141    | 72.0                          | 80.2                                          | 67.4 | 12.8  |
| 10    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 11    | .098                                            | .173                                      | 30.048  | .125    | 69.4                          | 77.8                                          | 63.0 | 14.8  |
| 12    | .105                                            | .189                                      | .039    | .150    | 69.1                          | 78.4                                          | 61.8 | 16.6  |
| 13    | .109                                            | .187                                      | .065    | .122    | 68.5                          | 78.0                                          | 60.8 | 17.2  |
| 14    | .070                                            | .157                                      | 29.993  | .164    | 68.3                          | 77.0                                          | 61.2 | 15.8  |
| 15    | .005                                            | .075                                      | .925    | .150    | 68.5                          | 78.0                                          | 61.2 | 16.8  |
| 16    | 29.986                                          | .066                                      | .937    | .129    | 68.3                          | 76.4                                          | 61.6 | 14.8  |
| 17    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 18    | 30.044                                          | .120                                      | .987    | .133    | 65.9                          | 75.2                                          | 58.9 | 16.3  |
| 19    | 29.998                                          | .088                                      | .921    | .167    | 67.0                          | 76.4                                          | 59.7 | 16.7  |
| 20    | 30.016                                          | .094                                      | .965    | .129    | 66.5                          | 76.0                                          | 58.4 | 17.6  |
| 21    | .027                                            | .106                                      | .979    | .127    | 68.1                          | 77.6                                          | 60.6 | 17.0  |
| 22    | .023                                            | .090                                      | .961    | .129    | 68.9                          | 78.4                                          | 60.4 | 18.0  |
| 23    | .010                                            | .094                                      | .947    | .147    | 68.3                          | 76.0                                          | 60.8 | 15.2  |
| 24    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 25    | <i>christmas</i>                                |                                           |         |         |                               |                                               |      |       |
| 26    | 29.995                                          | .090                                      | .943    | .147    | 66.7                          | 72.0                                          | 64.4 | 7.6   |
| 27    | 30.014                                          | .102                                      | .960    | .142    | 67.9                          | 78.2                                          | 60.3 | 17.9  |
| 28    | .004                                            | .088                                      | .939    | .149    | 67.1                          | 77.0                                          | 59.4 | 17.6  |
| 29    | 29.988                                          | .067                                      | .925    | .142    | 66.7                          | 76.2                                          | 59.2 | 17.0  |
| 30    | 30.019                                          | .110                                      | .965    | .145    | 66.5                          | 77.4                                          | 58.8 | 18.6  |
| 31    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in  
the month of December, 1854.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon. (Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of Hu-<br>midity complete sa-<br>turation being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                                | T. gr.                                                              |                                                                    |
| 1     | 68.6                            | 3.9                 | 66.6                | 5.9                          | 0.651                            | 7.12                                                  | 1.51                                                                | 0.825                                                              |
| 2     | 69.0                            | 3.8                 | 67.1                | 5.7                          | .661                             | .23                                                   | .48                                                                 | .830                                                               |
| 3     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                       |                                                                     |                                                                    |
| 4     | 68.7                            | 4.1                 | 66.6                | 6.2                          | .651                             | .12                                                   | .59                                                                 | .817                                                               |
| 5     | 67.3                            | 4.6                 | 65.0                | 6.9                          | .617                             | 6.77                                                  | .71                                                                 | .798                                                               |
| 6     | 65.0                            | 4.6                 | 62.7                | 6.9                          | .572                             | .30                                                   | .60                                                                 | .797                                                               |
| 7     | 65.5                            | 2.7                 | 63.9                | 4.3                          | .595                             | .58                                                   | .00                                                                 | .868                                                               |
| 8     | 66.9                            | 2.7                 | 65.5                | 4.1                          | .628                             | .92                                                   | 0.98                                                                | .876                                                               |
| 9     | 67.9                            | 4.1                 | 65.8                | 6.2                          | .634                             | .96                                                   | 1.54                                                                | .819                                                               |
| 10    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                       |                                                                     |                                                                    |
| 11    | 64.5                            | 4.9                 | 62.0                | 7.4                          | .559                             | .16                                                   | .70                                                                 | .784                                                               |
| 12    | 63.9                            | 5.2                 | 61.3                | 7.8                          | .546                             | .02                                                   | .76                                                                 | .774                                                               |
| 13    | 63.3                            | 5.2                 | 60.7                | 7.8                          | .536                             | 5.90                                                  | .75                                                                 | .771                                                               |
| 14    | 64.4                            | 3.9                 | 62.1                | 6.2                          | .561                             | 6.19                                                  | .41                                                                 | .814                                                               |
| 15    | 64.4                            | 4.1                 | 62.3                | 6.2                          | .565                             | .23                                                   | .42                                                                 | .814                                                               |
| 16    | 63.4                            | 4.9                 | 60.5                | 7.8                          | .532                             | 5.87                                                  | .73                                                                 | .772                                                               |
| 17    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                       |                                                                     |                                                                    |
| 18    | 61.4                            | 4.5                 | 58.7                | 7.2                          | .501                             | .56                                                   | .50                                                                 | .787                                                               |
| 19    | 62.6                            | 4.4                 | 60.0                | 7.0                          | .523                             | .79                                                   | .51                                                                 | .793                                                               |
| 20    | 62.4                            | 4.1                 | 59.9                | 6.6                          | .521                             | .77                                                   | .42                                                                 | .803                                                               |
| 21    | 64.1                            | 4.0                 | 61.7                | 6.4                          | .554                             | 6.12                                                  | .43                                                                 | .810                                                               |
| 22    | 65.4                            | 3.5                 | 63.6                | 5.3                          | .590                             | .50                                                   | .24                                                                 | .840                                                               |
| 23    | 65.3                            | 3.0                 | 63.5                | 4.8                          | .588                             | .48                                                   | .12                                                                 | .853                                                               |
| 24    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                       |                                                                     |                                                                    |
| 25    | <i>christmas</i>                |                     |                     |                              |                                  |                                                       |                                                                     |                                                                    |
| 26    | 64.4                            | 2.3                 | 63.0                | 3.7                          | .578                             | .40                                                   | 0.83                                                                | .885                                                               |
| 27    | 64.2                            | 3.7                 | 62.0                | 5.9                          | .559                             | .18                                                   | 1.33                                                                | .823                                                               |
| 28    | 62.6                            | 4.5                 | 59.9                | 7.2                          | .521                             | 5.77                                                  | .55                                                                 | .788                                                               |
| 29    | 62.6                            | 4.1                 | 60.1                | 6.6                          | .525                             | .81                                                   | .42                                                                 | .804                                                               |
| 30    | 61.5                            | 5.0                 | 58.5                | 8.0                          | .498                             | .51                                                   | .68                                                                 | .766                                                               |
| 31    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                       |                                                                     |                                                                    |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of December, 1854.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon. (Continued.)

| Hour.      | Mean Height of the Barometer at 32° Fahr. | Range of the Barometer for each hour during the Month. |         |         | Mean Dry Bulb Thermometer. | Range of the Temperature for each hour during the month. |      |       |
|------------|-------------------------------------------|--------------------------------------------------------|---------|---------|----------------------------|----------------------------------------------------------|------|-------|
|            |                                           | Max.                                                   | Min.    | Diff.   |                            | Max.                                                     | Min. | Diff. |
|            | Inches.                                   | Inches.                                                | Inches. | Inches. | °                          | °                                                        | °    | °     |
| Mid-night. | 30.034                                    | 30.111                                                 | 29.980  | 0.131   | 65.4                       | 69.7                                                     | 61.6 | 8.1   |
| 1          | .027                                      | .105                                                   | .974    | .131    | 64.8                       | 69.0                                                     | 61.0 | 8.0   |
| 2          | .017                                      | .104                                                   | .957    | .147    | 64.3                       | 68.5                                                     | 60.9 | 7.6   |
| 3          | .010                                      | .096                                                   | .949    | .147    | 63.6                       | 68.2                                                     | 60.5 | 7.7   |
| 4          | .011                                      | .077                                                   | .943    | .134    | 63.4                       | 67.9                                                     | 60.0 | 7.9   |
| 5          | .018                                      | .088                                                   | .948    | .140    | 62.8                       | 68.0                                                     | 59.0 | 9.0   |
| 6          | .032                                      | .107                                                   | .967    | .140    | 62.5                       | 67.8                                                     | 58.8 | 9.0   |
| 7          | .057                                      | .150                                                   | .997    | .153    | 62.2                       | 67.5                                                     | 58.4 | 9.1   |
| 8          | .086                                      | .172                                                   | 30.033  | .139    | 65.0                       | 70.8                                                     | 60.6 | 10.2  |
| 9          | .107                                      | .189                                                   | .047    | .142    | 68.0                       | 73.9                                                     | 63.6 | 10.3  |
| 10         | .107                                      | .187                                                   | .051    | .136    | 70.5                       | 75.6                                                     | 66.2 | 9.4   |
| 11         | .088                                      | .177                                                   | .041    | .136    | 73.0                       | 77.7                                                     | 66.8 | 10.9  |
| Noon.      | .052                                      | .131                                                   | .001    | .130    | 75.1                       | 79.8                                                     | 66.0 | 13.8  |
| 1          | .017                                      | .100                                                   | 29.970  | .130    | 76.2                       | 79.8                                                     | 67.6 | 12.2  |
| 2          | 29.994                                    | .072                                                   | .947    | .125    | 77.1                       | 81.2                                                     | 70.4 | 10.8  |
| 3          | .981                                      | .065                                                   | .930    | .135    | 77.1                       | 80.4                                                     | 71.6 | 8.8   |
| 4          | .976                                      | .068                                                   | .921    | .147    | 75.0                       | 78.5                                                     | 71.0 | 7.5   |
| 5          | .983                                      | .078                                                   | .930    | .148    | 73.7                       | 76.8                                                     | 70.4 | 6.4   |
| 6          | .990                                      | .085                                                   | .936    | .149    | 71.8                       | 75.5                                                     | 68.6 | 6.9   |
| 7          | 30.009                                    | .095                                                   | .958    | .137    | 70.2                       | 74.3                                                     | 67.4 | 6.9   |
| 8          | .024                                      | .111                                                   | .956    | .155    | 68.9                       | 73.0                                                     | 65.7 | 7.3   |
| 9          | .035                                      | .127                                                   | .914    | .213    | 67.8                       | 72.2                                                     | 63.4 | 8.8   |
| 10         | .042                                      | .133                                                   | .989    | .144    | 66.9                       | 71.7                                                     | 61.6 | 10.1  |
| 11         | .039                                      | .132                                                   | .985    | .147    | 66.1                       | 70.2                                                     | 61.4 | 8.8   |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of December, 1854.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon. (Continued.)

| Hour.          | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of Air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity<br>complete saturation be-<br>ing unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                  |
| Mid-<br>night. | 63.2                            | 2.2                 | 61.9                | 3.5                          | 0.557                            | 6.18                                             | 0.77                                                                    | 0.889                                                            |
| 1              | 62.7                            | 2.1                 | 61.4                | 3.4                          | .548                             | .10                                              | .73                                                                     | .893                                                             |
| 2              | 62.4                            | 1.9                 | 61.1                | 3.2                          | .543                             | .04                                              | .68                                                                     | .899                                                             |
| 3              | 61.6                            | 2.0                 | 60.2                | 3.4                          | .527                             | 5.87                                             | .70                                                                     | .893                                                             |
| 4              | 61.5                            | 1.9                 | 60.2                | 3.2                          | .527                             | .87                                              | .66                                                                     | .899                                                             |
| 5              | 61.1                            | 1.7                 | 59.9                | 2.9                          | .521                             | .81                                              | .60                                                                     | .906                                                             |
| 6              | 60.7                            | 1.8                 | 59.4                | 3.1                          | .513                             | .73                                              | .62                                                                     | .902                                                             |
| 7              | 60.6                            | 1.6                 | 59.5                | 2.7                          | .515                             | .75                                              | .54                                                                     | .914                                                             |
| 8              | 62.4                            | 2.6                 | 60.8                | 4.2                          | .537                             | .97                                              | .90                                                                     | .869                                                             |
| 9              | 64.2                            | 3.8                 | 61.9                | 6.1                          | .557                             | 6.16                                             | 1.37                                                                    | .818                                                             |
| 10             | 65.5                            | 5.0                 | 63.0                | 7.5                          | .578                             | .35                                              | .78                                                                     | .781                                                             |
| 11             | 66.9                            | 6.1                 | 63.8                | 9.2                          | .593                             | .49                                              | 2.27                                                                    | .741                                                             |
| Noon.          | 67.8                            | 7.3                 | 64.1                | 11.0                         | .599                             | .52                                              | .82                                                                     | .698                                                             |
| 1              | 68.2                            | 8.0                 | 64.2                | 12.0                         | .601                             | .53                                              | 3.13                                                                    | .676                                                             |
| 2              | 68.6                            | 8.5                 | 64.3                | 12.8                         | .603                             | .55                                              | .37                                                                     | .660                                                             |
| 3              | 68.6                            | 8.5                 | 64.3                | 12.8                         | .603                             | .55                                              | .37                                                                     | .660                                                             |
| 4              | 67.5                            | 7.5                 | 63.7                | 11.3                         | .591                             | .45                                              | .86                                                                     | .693                                                             |
| 5              | 67.5                            | 6.2                 | 64.4                | 9.3                          | .605                             | .62                                              | 2.34                                                                    | .739                                                             |
| 6              | 67.2                            | 4.6                 | 64.9                | 6.9                          | .615                             | .75                                              | 1.70                                                                    | .799                                                             |
| 7              | 66.6                            | 3.6                 | 64.8                | 5.4                          | .613                             | .76                                              | .29                                                                     | .840                                                             |
| 8              | 65.9                            | 3.0                 | 64.4                | 4.5                          | .605                             | .67                                              | .07                                                                     | .862                                                             |
| 9              | 65.1                            | 2.7                 | 63.5                | 4.3                          | .588                             | .50                                              | 0.98                                                                    | .869                                                             |
| 10             | 64.4                            | 2.5                 | 62.9                | 4.0                          | .576                             | .38                                              | .90                                                                     | .876                                                             |
| 11             | 63.8                            | 2.3                 | 62.4                | 3.7                          | .567                             | .28                                              | .82                                                                     | .885                                                             |

*Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December, 1854.*

Solar radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain.   | Prevailing direction of the Wind. | General Aspect of the sky.                                                                    |
|-------|-----------------------|---------|-----------------------------------|-----------------------------------------------------------------------------------------------|
|       | o                     | Inches. |                                   |                                                                                               |
| 1     | 130.0                 |         | N. W. or N.                       | Cloudless till 6 A. M. scattered ☉ or other clouds afterwards.                                |
| 2     | 136.0                 |         | Calm or N. E. or N. W. or N.      | Cloudless till 10 A. M. scattered ☉ till 3 P. M. cloudless afterwards and foggy after sunset. |
| 3     | <i>Sunday.</i>        |         |                                   |                                                                                               |
| 4     | 136.0                 |         | N. or N. W.                       | Scattered ☼ till 10 A. M. nearly cloudless afterwards.                                        |
| 5     | 137.2                 |         | N. or N. W.                       | Cloudless till 5 P. M. scattered ☼ afterwards.                                                |
| 6     | 129.7                 |         | N. W. or N.                       | Cloudless till 9 A. M. scattered ☼ till 7 P. M. cloudless afterwards.                         |
| 7     | ..                    |         | W. or N. or N. W.                 | Various clouds.                                                                               |
| 8     | ..                    |         | N. W. or calm.                    | Scattered ☼ or cloudy the whole day.                                                          |
| 9     | 138.0                 |         | W. or N.                          | Cloudy till 10 A. M. cloudless afterwards.                                                    |
| 10    | <i>Sunday.</i>        |         |                                   |                                                                                               |
| 11    | 135.6                 |         | N. or N. W.                       | Cloudless.                                                                                    |
| 12    | 134.9                 |         | N. W.                             | Ditto.                                                                                        |
| 13    | 135.0                 |         | N. W.                             | Ditto.                                                                                        |
| 14    | 134.8                 |         | W. or N. W.                       | Ditto.                                                                                        |
| 15    | 131.0                 |         | N. W.                             | Cloudless till Noon scattered ☼ or ☼ till 8 P. M. cloudless afterwards.                       |
| 16    | 132.0                 |         | N. W. or W.                       | Cloudless till 5 P. M. scattered ☼ till 7 P. M. cloudless afterwards.                         |
| 17    | <i>Sunday.</i>        |         |                                   |                                                                                               |
| 18    | 125.0                 |         | N. W.                             | Cloudless.                                                                                    |
| 19    | 133.8                 |         | N. W.                             | Cloudless till Noon scattered ☼ till 7 P. M. cloudless afterwards.                            |
| 20    | 133.0                 |         | Calm or N. W.                     | Cloudless till 6 A. M. scattered ☼ till 6 P. M. cloudless afterwards and also foggy.          |
| 21    | 132.0                 |         | N. W. or N.                       | Cloudless.                                                                                    |
| 22    | 137.0                 |         | N.                                | Ditto.                                                                                        |
| 23    | 127.0                 |         | N. or N. W.                       | Cloudless till 7 A. M. scattered ☼ or ☼ afterwards.                                           |
| 24    | <i>Sunday.</i>        |         |                                   |                                                                                               |
| 25    | <i>Christmas.</i>     |         |                                   |                                                                                               |
| 26    | ..                    |         | W. or N. W.                       | Cloudy till 3 P. M. and drizzling at Noon cloudless afterwards.                               |
| 27    | 137.0                 |         | N. W. or N.                       | Cloudless.                                                                                    |
| 28    | 135.5                 |         | N. or N. W.                       | Ditto.                                                                                        |
| 29    | 131.0                 |         | Calm or N. W.                     | Ditto.                                                                                        |
| 30    | 139.0                 |         | W. or N. or N. W.                 | Ditto.                                                                                        |
| 31    | <i>Sunday.</i>        |         |                                   |                                                                                               |

☼ Cirri, ☼ Cirro-strati, ☼ Cumuli, ☼ Cumulo-strati, ☼ Nimbi, — Strati, ☼ Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of January, 1855.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Height of the cistern of the Standard Barometer above the level of the Sea, <sup>feet</sup> 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempe-<br>rature during<br>the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|--------------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                             | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                                | o    | o     |
| 1     | New year's day.                                 |                                           |         |         |                               |                                                  |      |       |
| 2     | 29.986                                          | 30.066                                    | 29.924  | 0.142   | 66.2                          | 76.6                                             | 58.4 | 18.2  |
| 3     | 30.002                                          | .080                                      | .953    | .127    | 65.8                          | 73.6                                             | 59.2 | 14.4  |
| 4     | .016                                            | .100                                      | .960    | .140    | 68.3                          | 77.6                                             | 62.6 | 15.0  |
| 5     | .028                                            | .115                                      | .968    | .147    | 68.8                          | 78.8                                             | 61.6 | 17.2  |
| 6     | 29.975                                          | .075                                      | .888    | .187    | 70.2                          | 77.8                                             | 63.8 | 14.0  |
| 7     | Sunday.                                         |                                           |         |         |                               |                                                  |      |       |
| 8     | .881                                            | 29.937                                    | .846    | .091    | 66.3                          | 71.2                                             | 62.7 | 8.5   |
| 9     | .915                                            | .989                                      | .864    | .125    | 66.6                          | 76.0                                             | 59.0 | 17.0  |
| 10    | .875                                            | .959                                      | .802    | .157    | 69.5                          | 79.6                                             | 60.4 | 19.2  |
| 11    | .893                                            | .993                                      | .836    | .157    | 69.6                          | 75.7                                             | 65.0 | 10.7  |
| 12    | .950                                            | 30.019                                    | .912    | .107    | 68.3                          | 76.6                                             | 61.6 | 15.0  |
| 13    | .960                                            | .044                                      | .907    | .137    | 67.4                          | 75.4                                             | 60.4 | 15.0  |
| 14    | Sunday.                                         |                                           |         |         |                               |                                                  |      |       |
| 15    | 30.035                                          | .118                                      | .954    | .164    | 66.8                          | 75.2                                             | 61.4 | 13.8  |
| 16    | .065                                            | .157                                      | 30.011  | .146    | 64.3                          | 74.8                                             | 55.8 | 19.0  |
| 17    | .066                                            | .152                                      | .017    | .135    | 64.6                          | 75.2                                             | 55.7 | 19.5  |
| 18    | .046                                            | .125                                      | .006    | .119    | 65.9                          | 76.3                                             | 57.0 | 19.3  |
| 19    | .073                                            | .155                                      | .020    | .135    | 68.9                          | 77.0                                             | 62.6 | 14.4  |
| 20    | .117                                            | .219                                      | .070    | .149    | 65.1                          | 74.0                                             | 58.8 | 15.2  |
| 21    | Sunday.                                         |                                           |         |         |                               |                                                  |      |       |
| 22    | .029                                            | .112                                      | 29.954  | .158    | 61.4                          | 72.8                                             | 52.2 | 20.6  |
| 23    | .036                                            | .127                                      | .981    | .146    | 63.0                          | 73.8                                             | 54.4 | 19.4  |
| 24    | .042                                            | .132                                      | .966    | .166    | 62.6                          | 73.8                                             | 53.7 | 20.1  |
| 25    | 29.994                                          | .067                                      | .917    | .150    | 64.5                          | 75.8                                             | 55.0 | 20.8  |
| 26    | 30.024                                          | .092                                      | .966    | .126    | 66.7                          | 78.6                                             | 55.8 | 22.8  |
| 27    | .058                                            | .143                                      | .988    | .155    | 68.9                          | 79.8                                             | 59.4 | 20.4  |
| 28    | Sunday.                                         |                                           |         |         |                               |                                                  |      |       |
| 29    | .105                                            | .180                                      | 30.046  | .134    | 67.8                          | 77.8                                             | 59.0 | 18.8  |
| 30    | .153                                            | .249                                      | .081    | .168    | 66.1                          | 77.2                                             | 57.0 | 20.2  |
| 31    | .138                                            | .221                                      | .076    | .145    | 65.3                          | 76.4                                             | 56.0 | 20.4  |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of January, 1855.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon. (Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | New year's day.                 |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 2     | 62.5                            | 3.7                 | 60.3                | 5.9                          | 0.528                            | 5.86                                             | 1.26                                                                    | 0.823                                                               |
| 3     | 62.0                            | 3.8                 | 59.7                | 6.1                          | .518                             | .75                                              | .29                                                                     | .817                                                                |
| 4     | 63.8                            | 4.5                 | 61.1                | 7.2                          | .543                             | .99                                              | .61                                                                     | .788                                                                |
| 5     | 65.4                            | 3.4                 | 63.7                | 5.1                          | .591                             | 6.52                                             | .19                                                                     | .846                                                                |
| 6     | 66.2                            | 4.0                 | 64.2                | 6.0                          | .601                             | .61                                              | .44                                                                     | .821                                                                |
| 7     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 8     | 64.5                            | 1.8                 | 63.4                | 2.9                          | .586                             | .49                                              | 0.66                                                                    | .908                                                                |
| 9     | 63.6                            | 3.0                 | 61.8                | 4.8                          | .555                             | .15                                              | 1.06                                                                    | .853                                                                |
| 10    | 66.3                            | 3.2                 | 64.7                | 4.8                          | .611                             | .73                                              | .15                                                                     | .854                                                                |
| 11    | 65.5                            | 4.1                 | 63.4                | 6.2                          | .586                             | .45                                              | .45                                                                     | .816                                                                |
| 12    | 63.0                            | 5.3                 | 59.8                | 8.5                          | .520                             | 5.73                                             | .87                                                                     | .754                                                                |
| 13    | 62.2                            | 5.2                 | 59.1                | 8.3                          | .508                             | .62                                              | .77                                                                     | .760                                                                |
| 14    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 15    | 61.9                            | 4.9                 | 59.0                | 7.8                          | .506                             | .60                                              | .66                                                                     | .771                                                                |
| 16    | 58.8                            | 5.5                 | 54.9                | 9.4                          | .441                             | 4.91                                             | .81                                                                     | .731                                                                |
| 17    | 58.9                            | 5.7                 | 55.5                | 9.1                          | .450                             | 5.01                                             | .77                                                                     | .739                                                                |
| 18    | 60.2                            | 5.7                 | 56.8                | 9.1                          | .470                             | .21                                              | .85                                                                     | .738                                                                |
| 19    | 63.1                            | 5.8                 | 60.2                | 8.7                          | .527                             | .80                                              | .94                                                                     | .749                                                                |
| 20    | 58.7                            | 6.4                 | 54.9                | 10.2                         | .441                             | 4.90                                             | .99                                                                     | .711                                                                |
| 21    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 22    | 56.0                            | 5.4                 | 51.7                | 9.7                          | .396                             | .43                                              | .71                                                                     | .721                                                                |
| 23    | 57.1                            | 5.9                 | 53.0                | 10.0                         | .414                             | .62                                              | .83                                                                     | .716                                                                |
| 24    | 58.0                            | 4.6                 | 54.8                | 7.8                          | .440                             | .90                                              | .47                                                                     | .769                                                                |
| 25    | 59.3                            | 5.2                 | 56.2                | 8.3                          | .461                             | 5.13                                             | .63                                                                     | .759                                                                |
| 26    | 61.3                            | 5.4                 | 58.1                | 8.6                          | .491                             | .43                                              | .80                                                                     | .751                                                                |
| 27    | 63.4                            | 5.5                 | 60.6                | 8.3                          | .534                             | .88                                              | .86                                                                     | .760                                                                |
| 28    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 29    | 61.6                            | 6.2                 | 57.9                | 9.9                          | .488                             | .38                                              | 2.10                                                                    | .719                                                                |
| 30    | 59.6                            | 6.5                 | 55.7                | 10.4                         | .453                             | .03                                              | .07                                                                     | .708                                                                |
| 31    | 59.8                            | 5.5                 | 56.5                | 8.8                          | .465                             | .17                                              | 1.76                                                                    | .746                                                                |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
month of January, 1855.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.      | Mean Height of the Barometer at 32° Fahr. | Range of the Barometer for each hour during the month. |         |         | Mean Dry Bulb Thermometer. | Range of the Temperature for each hour during the month. |      |       |
|------------|-------------------------------------------|--------------------------------------------------------|---------|---------|----------------------------|----------------------------------------------------------|------|-------|
|            |                                           | Max.                                                   | Min.    | Diff.   |                            | Max.                                                     | Min. | Diff. |
|            | Inches.                                   | Inches.                                                | Inches. | Inches. | °                          | °                                                        | °    | °     |
| Mid-night. | 30.015                                    | 30.162                                                 | 29.849  | 0.313   | 62.8                       | 70.4                                                     | 56.6 | 13.8  |
| 1          | .008                                      | .159                                                   | .847    | .312    | 62.1                       | 70.4                                                     | 56.0 | 14.4  |
| 2          | 29.999                                    | .152                                                   | .839    | .313    | 61.5                       | 70.0                                                     | 55.3 | 14.7  |
| 3          | .989                                      | .143                                                   | .836    | .307    | 60.8                       | 69.4                                                     | 54.4 | 15.0  |
| 4          | .986                                      | .134                                                   | .844    | .290    | 60.2                       | 68.2                                                     | 53.6 | 14.6  |
| 5          | .995                                      | .145                                                   | .852    | .293    | 59.6                       | 66.1                                                     | 53.0 | 13.1  |
| 6          | 30.011                                    | .151                                                   | .864    | .287    | 59.3                       | 65.8                                                     | 52.4 | 13.4  |
| 7          | .036                                      | .165                                                   | .889    | .276    | 59.0                       | 65.0                                                     | 52.2 | 12.8  |
| 8          | .066                                      | .200                                                   | .910    | .290    | 61.0                       | 65.2                                                     | 55.0 | 10.2  |
| 9          | .092                                      | .231                                                   | .935    | .296    | 64.6                       | 68.9                                                     | 59.8 | 9.1   |
| 10         | .100                                      | .249                                                   | .937    | .312    | 67.9                       | 72.0                                                     | 61.8 | 10.2  |
| 11         | .086                                      | .232                                                   | .931    | .301    | 70.7                       | 74.6                                                     | 65.0 | 9.6   |
| Noon.      | .055                                      | .202                                                   | .889    | .313    | 73.2                       | 76.8                                                     | 68.8 | 8.0   |
| 1          | .019                                      | .166                                                   | .849    | .317    | 74.7                       | 78.6                                                     | 70.6 | 8.0   |
| 2          | 29.993                                    | .134                                                   | .833    | .301    | 75.6                       | 79.4                                                     | 70.8 | 8.6   |
| 3          | .975                                      | .098                                                   | .808    | .290    | 75.8                       | 79.8                                                     | 71.2 | 8.6   |
| 4          | .965                                      | .091                                                   | .802    | .289    | 74.0                       | 78.0                                                     | 70.2 | 7.8   |
| 5          | .969                                      | .084                                                   | .812    | .272    | 72.5                       | 76.6                                                     | 69.8 | 6.8   |
| 6          | .975                                      | .081                                                   | .821    | .260    | 70.3                       | 74.1                                                     | 66.6 | 7.5   |
| 7          | .992                                      | .111                                                   | .829    | .282    | 68.6                       | 72.3                                                     | 64.2 | 8.1   |
| 8          | 30.010                                    | .128                                                   | .845    | .283    | 67.1                       | 71.4                                                     | 62.7 | 8.7   |
| 9          | .025                                      | .145                                                   | .854    | .291    | 65.8                       | 70.8                                                     | 61.2 | 9.6   |
| 10         | .034                                      | .151                                                   | .858    | .293    | 64.7                       | 70.6                                                     | 59.6 | 11.0  |
| 11         | .029                                      | .158                                                   | .848    | .310    | 63.8                       | 70.5                                                     | 57.7 | 12.8  |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in the  
Month of January, 1855.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon. (Continued.)

| Hour.          | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of Air. | Additional weight of va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| Mid-<br>night. | 60.5                            | 2.3                 | 58.9                | 3.9                          | 0.504                            | 5.62                                             | 0.79                                                                    | 0.877                                                             |
| 1              | 60.0                            | 2.1                 | 58.5                | 3.6                          | .498                             | .56                                              | .71                                                                     | .887                                                              |
| 2              | 59.5                            | 2.0                 | 58.1                | 3.4                          | .491                             | .50                                              | .66                                                                     | .893                                                              |
| 3              | 58.8                            | 2.0                 | 57.2                | 3.6                          | .476                             | .33                                              | .69                                                                     | .885                                                              |
| 4              | 58.1                            | 2.1                 | 56.4                | 3.8                          | .464                             | .20                                              | .71                                                                     | .880                                                              |
| 5              | 57.7                            | 1.9                 | 56.2                | 3.4                          | .461                             | .18                                              | .62                                                                     | .893                                                              |
| 6              | 57.4                            | 1.9                 | 55.9                | 3.4                          | .456                             | .13                                              | .61                                                                     | .894                                                              |
| 7              | 56.9                            | 2.1                 | 55.2                | 3.8                          | .445                             | .01                                              | .68                                                                     | .880                                                              |
| 8              | 58.4                            | 2.6                 | 56.3                | 4.7                          | .462                             | .18                                              | .88                                                                     | .855                                                              |
| 9              | 60.1                            | 4.5                 | 57.4                | 7.2                          | .480                             | .33                                              | 1.45                                                                    | .786                                                              |
| 10             | 61.6                            | 6.3                 | 57.8                | 10.1                         | .486                             | .37                                              | 2.14                                                                    | .715                                                              |
| 11             | 62.9                            | 7.8                 | 59.0                | 11.7                         | .506                             | .55                                              | .63                                                                     | .678                                                              |
| Noon.          | 64.3                            | 8.9                 | 59.8                | 13.4                         | .520                             | .68                                              | 3.14                                                                    | .644                                                              |
| 1              | 65.1                            | 9.6                 | 60.3                | 14.4                         | .528                             | .76                                              | .47                                                                     | .624                                                              |
| 2              | 65.8                            | 9.8                 | 60.9                | 14.7                         | .539                             | .86                                              | .62                                                                     | .618                                                              |
| 3              | 65.9                            | 9.9                 | 60.9                | 14.9                         | .539                             | .86                                              | .68                                                                     | .614                                                              |
| 4              | 64.9                            | 9.1                 | 60.3                | 13.7                         | .528                             | .76                                              | .28                                                                     | .637                                                              |
| 5              | 64.5                            | 8.0                 | 60.5                | 12.0                         | .532                             | .83                                              | 2.80                                                                    | .676                                                              |
| 6              | 64.6                            | 5.7                 | 61.7                | 8.6                          | .554                             | 6.08                                             | .00                                                                     | .752                                                              |
| 7              | 64.0                            | 4.6                 | 61.7                | 6.9                          | .554                             | .10                                              | 1.57                                                                    | .795                                                              |
| 8              | 63.1                            | 4.0                 | 60.7                | 6.4                          | .536                             | 5.93                                             | .39                                                                     | .810                                                              |
| 9              | 62.4                            | 3.4                 | 60.4                | 5.4                          | .530                             | .89                                              | .15                                                                     | .837                                                              |
| 10             | 61.7                            | 3.0                 | 59.9                | 4.8                          | .521                             | .79                                              | .01                                                                     | .851                                                              |
| 11             | 61.3                            | 2.5                 | 59.5                | 4.3                          | .515                             | .73                                              | 0.88                                                                    | .867                                                              |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta, in  
the month of January, 1855.*

Solar radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain.   | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                  |
|-------|-----------------------|---------|-----------------------------------|---------------------------------------------------------------------------------------------|
|       | o                     | Inches. |                                   |                                                                                             |
| 1     | New year's day.       |         |                                   |                                                                                             |
| 2     | 134.0                 | ..      | N. or N. N. W. or N. W.           | Cloudless and fogs in the morning and evening. [afterwards.                                 |
| 3     | 123.0                 | ..      | Calm or N. W.                     | Cloudless till 5 A. M. clear or less cloudy                                                 |
| 4     | 137.2                 | ..      | N. or N. W. or S. W.              | Cloudy till 7 A. M. scattered \i afterwards. [afterwards.                                   |
| 5     | 135.7                 | ..      | W. or S. W.                       | Various clouds till 10 A. M. cloudless                                                      |
| 6     | 128.0                 | ..      | Calm or S. or S. E.               | Cloudless till 5 A. M. scattered \i or \i till 6 P. M. cloudy afterwards. [terwards.        |
| 7     | Sunday.               |         |                                   |                                                                                             |
| 8     | 111.0                 | 0.46    | S. E. or N. W.                    | Various clouds till 5 P. M. cloudless af-                                                   |
| 9     | 134.8                 | ..      | W. or N. N. W. or N. W.           | Cloudless till 10 A. M. scattered \i till 4 P. M. cloudless afterwards.                     |
| 10    | 137.0                 | ..      | N. W. or S. or S. W.              | Cloudless till 9 A. M. scattered \i or \i till 3 P. M. cloudless afterwards.                |
| 11    | 131.0                 | ..      | N. W. or S. W.                    | Scattered \i till 11 A. M. cloudless afterwards.                                            |
| 12    | 135.0                 | ..      | Calm or N. W.                     | Scattered \i till 6 A. M. cloudless till 3 P. M. scattered clouds afterwards.               |
| 13    | 131.7                 | ..      | N. or N. E.                       | More or less cloudy the whole day.                                                          |
| 14    | Sunday.               |         |                                   |                                                                                             |
| 15    | 133.8                 | ..      | N. or N. W. or N. N. W.           | Various clouds till 11 A. M. cloudless afterwards.                                          |
| 16    | 133.0                 | ..      | N. or N. W.                       | Cloudless.                                                                                  |
| 17    | 134.0                 | ..      | N. W. or N. E. or N. N. W.        | Ditto.                                                                                      |
| 18    | 133.0                 | ..      | N.                                | Cloudless till 5 A. M. scattered \i till 10 A. M. cloudless till 2 P. M. cloudy afterwards. |
| 19    | 133.0                 | ..      | N. W.                             | Various clouds the whole day.                                                               |
| 20    | 134.0                 | ..      | N. or N. W.                       | Cloudless till 10 A. M. scattered \i and \i till 3 P. M. cloudless afterwards.              |
| 21    | Sunday.               |         |                                   |                                                                                             |
| 22    | 129.0                 | ..      | Calm or N. N. W. or W.            | Cloudless.                                                                                  |
| 23    | 133.0                 | ..      | W. or N. W.                       | Cloudless till Noon, scattered \i till 6 P. M. cloudless afterwards.                        |
| 24    | 131.0                 | ..      | N. W.                             | Cloudless till 5 A. M. scattered \i till 7 P. M. cloudless afterwards.                      |
| 25    | 129.8                 | ..      | W. or S. W.                       | Cloudless nearly the whole day. [night.                                                     |
| 26    | 135.0                 | ..      | Calm or S. W.                     | Cloudless and slightly foggy during the                                                     |
| 27    | 139.0                 | ..      | Calm or N. W. or S.               | Cloudless.                                                                                  |
| 28    | Sunday.               |         |                                   |                                                                                             |
| 29    | 136.2                 | ..      | W. or N. or N. W.                 | Cloudless till 7 A. M. scattered \i or \i till 3 P. M. cloudless afterwards. [day.          |
| 30    | 134.5                 | ..      | N. or W. or N. W.                 | Cloudless and slightly foggy during the                                                     |
| 31    | 131.5                 | ..      | W. or N. N. W. or N. W.           | Cloudless and slightly foggy in the morning and evening.                                    |

\i Cirri, \i Cirro-strati, \i Cumuli, \i Cumulo-strati, \i Nimbi, —i Strati, \i i Cirro-cumuli.





